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GAS IN ENGLAND.

An examination of the illuminating power and chemical quality of the gas manufactured by the Newcastle and Gateshead Union Gas Company has recently been made by Mr. John Pattinson, chemist, who reports the illuminating power to be as follows:

1863.	Standard Sperm Candles.
Jan. 27	16.49
" 28	16.49
" 29	14.90
" 30	14.55
" 31	15.63
Average of five days	15.57

In estimating the illuminating power of the gas, the usual method was adopted by burning the gas at the rate of 5 cubic feet per hour, from an argand burner having 15 holes, and a 7-inch chimney, and comparing the light thus produced with the light of a standard sperm candle burning 120 grains per hour. The experiments were made at a distance of 1,000 yards from the gas-works. Each of the above results, says Mr. Pattinson, is the result of about twelve observations. The conclusion drawn from the results of the experiments is, that the gas consumed in Newcastle-upon-Tyne is much superior to the average of London gas, and is 3.57 candles above the limit prescribed by the metropolis gas act.

Mr. Pattinson also made an examination of the chemical quality of this gas. He reported it to be entirely free from sulphuretted hydrogen, and nearly so from ammonia; it containing only 0.86 of a grain of the latter in 100 cubic feet. The amount of sulphur, however, was quite large, although only about half as much as Dr. Letheby has lately reported in the gas of the Great Central, the Chartered, and the Commercial gas companies which we puplished on page 289 of this volume. The following is the tabular statement of the amount of sulphur in the Newcastle gas:

Date of Experiment.	Cubic feet Consumed.	Amt. of sulphur in 100 c. f.
January 17	3	8.35 grs.
" 20	4½	10.71 "
" 22	3	11.19 "
" 23	4½	10.23 "
" 24	4	11.16 "
Average		10.33 "

In Mr. Pattinson's report, the total amount of sulphur found in London gas is estimated at from 7 to 12 grains per 100 cubic feet, whereas Dr. Letheby, in the report which we have above referred to, places the amount in the gas of the three companies named at more than 20 grains per 100 cubic feet. Either of these amounts, however, is very large, and it is wholly without excuse for the companies to permit their gas to be distributed in so impure a condition.

VALUE OF TOWN SEWAGE.

Alderman Mechi, of London, recently read a paper before the London Farmer's Club on "Town Sewage." The following is a portion of his remarks:

"I think we are all agreed that the great want of British agriculture is more manure. On this point there is a remarkable unanimity among farmers. We may over-manure for our cereals, but never for our pastures—rye-grass, green, root and leguminous crops. It is impossible to take a railway trip through almost any district of the United Kingdom without being convinced that it is only half manured, and that its powers of production might be greatly increased. The use of town sewage will render less necessary the purchase of guano and artificial manures, and it will diminish the necessity for purchasing foreign feeding stuffs as a source of manure. This is a very important consideration, for I know one Norfolk farmer who pays £3,000 annually for linseed-cake alone; and another who, during his holding, has paid £70,000 for cake, and £50,000 for artificial manures, being equal to £100 per acre over his whole farm. The once sandy wastes on the sea-shore near Edinburgh, not then worth 5s. per acre, now produce an annual income of from £20 to £30 per acre, solely by the application of town sewage. By large applications of sewage the crops of grasses (and consequently of milk, butter, cheese, meat, and manure) may be increased from three to six fold and upwards, according to soil. Now, supposing that a tenant has a long lease of a suitable farm, it is quite clear that his present rent, chargeable against each ton of produce grown on the sewaged land, will be gradually diminished from 25 to 70 or 80 per cent. But there is this enormous additional advantage, that, having four times as much manure from the produce of the sewaged soil, he will be enabled to grow much heavier crops on the other parts of his farm unsewaged, and thus increase the profits over the whole of his farm. Taking the cost of consumable products (liquid and solid) used by the thirty millions of our population at £9 a head, or £270,000,000, and the excrementious residue of such consumption at the very low estimate of one tenth of the cost of the articles consumed, we should have as a result an excretal value of £27,000,000 Seeing that more than one-third of our population live in towns, we may reasonably ask, is it not an act of folly, and a gross commercial error, to waste such a treasure instead of availing ourselves of it to fertilize our soil and cheapen and increase our food? We paid for foreign produce £76,000,000 in the year 1861. Ought not the excretal result of such an enormous importation to have greatly fertilized our soil? In London alone the horses consume 30,000 quarters of oats per week, and hay in proportion.

THE WATER OF THE THAMES.

Dr. Letheby, of London, examined the waters of the Thames during the years 1861 and 1862, and arrived at the following conclusions from the results of his examination: 1st. That the water in the middle of the river is invariably charged with a larger proportion of dissolved matter than that near to the shore, but the quantity of suspended matter is greatest in the shore water. 2d. That the proportion of saline matter in the water is greatly influenced by the rainfall and by the temperature of the river; for when the former is less than two inches in the month, and the latter is over 60° Fahrenheit, the quantity of saline matter quickly rises from the normal proportion of about 32 grains in the gallon to upwards of 100 grains. 3d. That when, from evaporation and a diminished rainfall, the supply of water to the river is from the ocean instead of from the land, the mixture of sea-water with the sewage causes an offensive decomposition which gives an unpleasant odor to the river. 4th. That during strong winds, and at the proportions of the several constituents of the water during the first six months of the year, viz., from January to June. At that time the amount of saline matter ranges from 22 grains to 34 grains in the gallon, and of this quantity about 3.5 grains are organic. In the summer and autumn months, when evaporation from the river is large, the quantity of dissolved saline matter in the water sometimes exceeds 150 grains in the gallon. This shows that those times of the year there is a strong upward current from the ocean, and it indicates the necessity, at those periods, for a very perfect defacation of the sewage of the metropolis, which is to be discharged into the river at Barking Creek. If this circumstance is disregarded, the condition of the river in after time, when the main-drainage scheme is completed, will be unbearable and absolutely dangerous to health. Finally, it may be said that the result of the constant examinations of the river water has been gradually improving, and that the special manufacturing impurities which were once so constantly present in the water are now no longer there. This is attributable to the careful supervision which is exercised by the officers of the Conservancy in preventing the discharge of such matters into the stream.—*London Artizan.*

COAL TAR COLORS.

PEONINE AND AZULINE.

Messrs. Guinon, Marnas and Bonnet, of Lyons, France, have recently patented an additional coloring matter from coal tar. The object of their invention is to transform carbolic acid into a red coloring matter, and then to convert it into a fast color, capable of resisting acids and other agents. They take about 23 pounds of carbolic acid, from 10 to 20 pounds of oxalic acid, and from 7 to 14 pounds of sulphuric acid. This mixture is heated until the coloring matter is formed of the requisite consistence; the excess of acid is then removed with boiling water, when it assumes the state of a light pitch, with a green shade of cantharides. It may be dried and reduced to a powder by exposure to the air, or by means of a stove. To convert this into a more solid matter, take 2¼ pounds of this less solid matter and about 5½ pounds of the ammonia of commerce. This mixture is then put into a closed metallic vessel, then heated to a temperature of about 270° Fahrenheit for about three hours. This is allowed to cool, and then the vessel is opened. The matter originally introduced therein becomes completely dissolved in the ammonia, thence yielding a liquor rather thick, and with a considerable coloring power. This liquor, when treated with acids, furnishes a deep red precipitate, which is the new matter modified as required. Thus "peonine" is applicable to the dyeing of silk, wool, &c., red. By combining five parts of peonine with about six or eight parts of aniline, a blue coloring matter is produced. The mixture is heated to a temperature near the boiling point, which is maintained for some hours, until the material is completely transformed. The result thus obtained is a blue coloring matter, which is purified by means of successive washings—first with acidulated boiling water, next with heated coal oil, and lastly with a dilute solution of caustic alkali. The matter thus obtained is passed into acidulated boiling water, then dried. It is then in the form of a powder, with golden shades, soluble in alcohol, methyl, and other spirits, and the solutions of which may be used directly for dyeing and printing. This "azuline" blue is said to be a very beautiful color.

BOWDITCH'S GAS PURIFYING PROCESS.—Dr. Frankland, in his recent lecture on "Artificial Illumination," spoke in very favorable terms of Rev. Mr. Bowditch's process for abstracting bisulphide of carbon from coal-gas. It will be remembered by our readers that, a few years ago, Mr. Lewis Thompson, a distinguished gas chemist, pronounced this process utterly worthless for any practical purposes. The adverse opinions of these eminent chemists ought to be reconciled. Who will take up the investigation and decide the matter?

WATER-WORKS OF AMERICA.

BROOKLYN, N. Y.

Through the courtesy of Robert W. Hamilton, Esq., the engineer in charge of the pumping-engines of the Nassau Water Commissioners of Brooklyn, N. Y., we have received a copy of their last annual report.

The total receipts of the department, from January 1st, 1862, to January 1st, 1863, have been as follows:

Regular water rates	236,226 71
Extra do	65,743 33
Water permits (less amount paid tapper)	1,325 89
	$303,295 93

CONSUMPTION OF WATER.

The quantity of water used during the past year amounts to (1,888,772,373) one thousand eight hundred and eighty-eight millions seven hundred and seventy-two thousand three hundred and seventy-three gallons. Of this, there has been used for manufacturing and other than domestic purposes, (176,175,714) one hundred and seventy-six millions one hundred and seventy-five thousand seven hundred and fourteen gallons. For fire purposes there has been used (5,957,040) five millions nine hundred and fifty-seven thousand and forty gallons; for incidental purposes there has been used (2,850,000) two millions eight hundred and fifty thousand gallons; and for domestic purposes (1,703,789,619) one thousand seven hundred and three millions seven hundred and eighty-nine thousand six hundred and nineteen gallons.

Like all other water-works, the Brooklyn works are suffering from a constant waste of water. After using all possible vigilance in endeavoring to protect the works from waste, by passing stringent rules and regulations for the government of the consumers, and appointing inspectors, whose duty it is to constantly guard the distribution of water and enforce these rules and regulations; notwithstanding all these efforts, there are large quantities of water running to waste daily, through carelessness of consumers and otherwise; and the conclusion is thus reached, that *there is no way to remedy the evil but by the gradual introduction of meters, which has already been done to some extent with satisfactory results.*

SEWERS AND DRAINAGE.

The system of sewerage and drainage adopted for Brooklyn, by its commissioners, is entirely successful, and is far superior to any other plan that has been adopted in this country. Several cities are about adopting this plan, and from the favorable notice of the system taken by Mayor Opdyke, of this city, in his annual message, it is supposed it will be adopted here also. No city has ever been sewered to such an extent as Brooklyn in the same space of time and at so cheap a rate. The laying of such a large quantity of sewers was rendered necessary by the extent of water-pipes laid in the city at the time the commissioners commenced their labors. To enjoy fully the benefits of the introduction of the Ridgewood water, it was necessary to sewer the most thickly inhabited portion of the city at once.

From July, 1858, to January, 1862, there were built 86 27-100 miles of sewers. The total number of miles built under the direction of the commissioners to January, 1863, is 92 04-100 miles, of which 12 17-100 miles are brick sewers, varying in size from twenty-four inches diameter to seventy-two inches diameter; the balance are pipe sewers of twelve, fifteen, and eighteen inches diameter.

SUPPLY PONDS.

These are now, and have been during the year, all in good and serviceable condition. The water has been allowed to flow into the conduit from each of the ponds about equal to their minimum summer delivery, and the surplus of this, not required by the city, has been wasted from the conduit at the second waste-weir, east of the engine-house.

The masonry at all the dams, waste-weirs and sluice-ways is in good repair, and appears to be perfectly secure. The dams show no signs of any leaks, and have required very few repairs during the past year. The chief of these was at Brookfield pond. A mill-dam, above the works on the same stream, was carried away by a violent rain-storm in March, and this sudden rise of water did some injury to the shore embankments, and the increased head of water burst the branch conduit, leading from this pond, at a point one hundred and fifty feet below the dam.

AREA OF THE FIVE EASTERLY PONDS.

NAME OF POND.	Area of Pond and Grounds Acres.	Water surface Acres.	Surface above tide, in feet.	Drainage Area. Sq. miles.	Minimum Summer delivery, N. Y. gallons per diem.
Hempstead	26 5/10	23 52/100	10 6/10	25 70/100	8,500,000
Rockville	15 5/10	8	12	8 31/100	2,800,000
Valley Str'm	23 2/10	17 78/100	12 8/10	6 38/100	2,600,000
Clear Stream	1 8/10	1 07/100	11 5/10	8 87/100	800,000
Brookfield	11 88/100	8 76/100	15 4/10		2,600,000
Jamaica	67 335/1000	40	7 9/10	10 83/100	3,300,000
	146 295/1000	99 12/100		60 23/100	20,000,000

The average rain-fall over this drainage district, as shown by the rain-gauge, kept at Union Hall, Jamaica, has been, for the past thirty-seven years, 39 60-100 inches.

The minimum rain-fall was, in the year 1835, 28 78-100 inches. The maximum, in the year 1859, was 59 68-100.

CONDUIT AND BRANCH CONDUITS.

The main conduit, and the branches leading to the five ponds, viz.: Jamaica, Brookfield, Clear Stream, Valley Stream and Rockville, are now all in good condition, as respects their masonry, embankments, culverts and waste-weirs and appurtenances. The water was drawn off in September, and the annual examination of the interior made by the President of the Board of Commissioners and the engineer. The masonry was found, throughout the whole line, from Hempstead pond to the pump-well, to be in good condition, being sound and exhibiting no signs of any settlement. There were found at the junction of two of the branch conduits a few yards of sand, and on the section in the deep cut, next the engine-house, there were also about one hundred cubic yards of sand, which had been washed in through the openings left in the side to allow the spring water to enter the conduit. These openings had been found to admit quite a large quantity of sand, and on that account had been closed up by order of the constructing board before the work was transferred; but, as the water had not been drawn off, this sand had never been removed.

The water was kept out of the conduit for three days, and it was thoroughly cleaned, and two or three places in the masonry, which required pointing, were attended to. The windows in the house, over the terminal basin, were closed up with masonry.

PUMPING-ENGINES AND ENGINE-HOUSES.

The report of the engineer in charge of the pumping-engines, Mr. R. W. Hamilton, gives some details respecting the working of the engines during the year, from which it will be seen that the total expense of pumping at Ridgewood, including all labor, fuel, repairs to engines and engine-buildings, was $23,976 30-100. The total number of gallons pumped into the reservoir has been 1,962,131,200. This shows the cost of pumping, including all repairs to engines and engine-buildings, to have been $12 22-100 per 1,000,000 gallons, or one cent and two mills per 1,000 gallons. This should be increased by the amount due to interest on the cost of the engines, engine-house, pump-well, coal-sheds, railroad track, and engineer's house, which was about $300,000, making the interest on the same, at six per cent., $18,000. The cost per 1000,000 gallons due to this interest has been $9 04-100; add the cost for labor, coal, &c., $12 22-100, we have the total cost of the water to the city, for the past year, $21 26-100 per 1,000,000 gallons, or two cents and one and one-fourth mills per 1,000 gallons more than it would have cost if it had flowed directly from the ponds to the reservoir by gravitation.

The water is here elevated one hundred and sixty-three feet. The gallon here used, and throughout this report, is the New York gallon—eight pounds water. The two engines at Ridgewood can pump 20,000,000 gallons per day.*

Hence it is readily seen that, as the quantity to be pumped increases, the cost per million gallons for pumping will diminish.

The wants of the city, at present, require these engines to be worked only up to about one-third their capacity.

The duty of these engines has averaged, for the year, 526,936 pounds, raised one foot high, with one pound of coal for engine No. 1, and 555,628 ft. pounds for engine No. 2. The contract duty of these engines was 600,000 pounds, to be raised one foot high with one pound of coal. The average duty for the whole year has been within about 9¾ per cent. of this maximum duty. The coal used is anthracite, of the variety called Lackawanna. The engines are believed to be now in as perfect working condition as they have been at any time since their construction. Great credit is due Mr. Hamilton for the careful, systematic, and economical manner in which they have been worked.

PROSPECT HILL ENGINE.

This engine was completed and transferred by the Constructing Board of Water Commissioners in May last. The engine has been run only 285 hours in all, since that time, having been started at 8 o'clock P. M., and run until 5 o'clock A. M., generally for five nights in one week of each month. It is not required to be run oftener, because the higher portions of the city that will be hereafter supplied from Mount Prospect reservoir, are, so far as they require water, supplied from Ridgewood reservoir. Hence it is only necessary to run this engine to keep the reservoir full, the water in it being occasionally drawn off to give it circulation and keep it pure. The engine pumps directly from the main, and has been run at no time longer than nine hours, requiring the fires to be started anew each time. It will thus be seen that very favorable results, as to duty, could not be expected under these circumstances. Its capacity is over 3,000,000 gallons in sixteen hours, and the duty, as shown by the test trial of W. E. Worthen, C. E., was 684,042 pounds raised one foot high with one pound of coal.

This engine is now in perfect working condition.

The expenditures here have been:

For tools, &c., needed about the engine and building	208 07
For gauges and air-pumps for vacuum chambers	117 37
For repairs	3 50
Total expenditures	$328 94

RIDGEWOOD RESERVOIR.

This reservoir is now, and has been during the year, in good condition. The masonry all appears to be secure and sound. The banks have shown no indications of settlement or leaks. The water was drawn down to the depth of four feet in May, both to blow off the pipes in the city thoroughly, and also to examine the reservoir, and ascertain whether there was any sediment in the bottom to require removal. The bottom was found to be so free from deposit as not to require cleaning. Some portions of the slope walls required pointing, which was thoroughly done. The outer slopes of the embankments have also required some repairs, which have been done under the direction of the keeper.

The total expenses for repairs for the year have been $435 80-100.

The average depth of water in this reservoir has been 13½ feet.

Average number gallons in the reservoir has been 99,902,782.

MOUNT PROSPECT RESERVOIR.

This reservoir was transferred by the Constructing Board of Commissioners in January, 1862. The reservoir was filled to the depth of about twelve feet in December, 1861, and thus kept until the completion and testing of the engine in May, 1862, when the water was raised to the height of twenty feet. The reservoir was filled rapidly at the time, and possibly from this cause occurred a crack, about three-eighths inch wide, in the lining at the southeast corner, some eight feet below the top, and extending diagonally each

* Engine No. 1 pumped, during a test trial made January 13th and 14th, 1860, 10,293,102 gallons in sixteen hours. Engine No. 2 pumped, during a test trial made October 23d and 24th, 1861, 10,403,414 gallons in sixteen hours.

way nearly to the bottom of the reservoir. On examining this corner, it was found that the puddling beneath the lining had settled about one inch at this point. This part of the lining, about five cubic yards, was taken out and relaid. There was also a smaller crack in the lining of the opposite corner, which was repaired by grouting and pointing. The reservoir was then filled, and has been kept since with the water about twenty feet deep. It has been connected with the general distribution by laying a 20-inch main in Flatbush avenue.

There are at present no distributing pipes laid in the higher portions of the city, that will ultimately be supplied from this reservoir. Hence the reservoir is now used as a store reservoir of 20,000,000 gallons, in case of accidents to the thirty-six inch main from Ridgewood, and other causes which may require an increased head of water in the city. The 20-inch main in Ninth avenue will probably be laid the present year, when the residents along that avenue, in the direction of Greenwood, will be supplied from this reservoir. The masonry, embankments, gate-house, and grounds are now all in good condition. There has never been any leak here, nor any settlement of the embankments, since the completion of the works, and the slight repairs alluded to above are all that have been made or required on the masonry or embankments. The expense for repairs and cleaning out this reservoir has been $161 86-100.

DISTRIBUTION.

There have been no breaks, and but two leaks in the mains, and but very trifling ones in the distributing pipes, and these have been repaired with the utmost promptness immediately after their occurrence. The extension of the distribution has been made under the direction of the Constructing Board of Commissioners, the same as heretofore, since the first commencement of the construction of the works. The length of new pipes laid the present year has been 11 93-100 miles, making the total number of 156 39-100 miles now laid in the city. In making connections with the pipes previously laid, there have been several opportunities to examine the effects of the coating in protecting the interior of the pipes from corrosion. The coating used on the pipes is Dr. Smith's coal pitch varnish. All the pipes laid since the completion of Messrs. Welles & Co.'s contract, viz: the last thirty-six miles laid, and also a portion of those laid under that contract, have been coated with this varnish. In one instance, a coated pipe, twenty inches in diameter, was cut out to put in a branch connection. This pipe had been laid before the water was introduced into the city, and had been exposed to the action of the water a little more than three and one-half years. Its interior surface was found, on examination, to be quite free from rust and incrustation, in fact, the coating appeared nearly perfect. Another twenty-inch pipe on the same line was cut out for the same purpose, at a short distance from this, which had not been coated. This last had been exposed to the action of the water about the same length of time—the first having been cut out in July and this in November. This uncoated pipe was found to have its interior surface closely incrusted with tubercles rising from the surface of the pipe, about one-half inch in height, its available area being thus reduced to about 19 inches, or 10 per cent. Numerous other instances might be mentioned, that have come under observation the past year, showing the worth of the coating as a protection to the pipes. Hence the conclusion is warranted, that this coating is a valuable precaution for the preservation of the pipes.

CONSUMPTION OF WATER.

The average daily consumption of water has been as follows:

January	4,800,311
February	4,670,018
March	4,617,654
April	4,644,564
May	4651,934
June	5,046,498
July	5,698 883
August	5,915,185
September	6,000,336
October	5,631,595
November,	5,173,999
December	6,078923

The average daily consumption for the year was 5,249,186—say, 5,250,000 gallons. The total number of taps or service connections, including those for manufactories, &c., is now (January 1, 1863), 16,186. The average number for 1832 was 15,105. It will be a fair assumption to say, that these represent a population of 151,690 supplied with water. This is allowing ten persons to each house. If, therefore, 151,000 inhabitants have been supplied with water, using 5,250,000 gallons per day, the average for each person has been 34 77-100, say 35 gallons per day. The average daily consumption for the year 1860 was 3,439,263 gallons. The average number of taps was 9,020—making 381 29-100 gallons per day for each service-pipe, or 38 12-100 gallons per capita.

SECOND DISTRIBUTING MAIN.

The subject of laying a second distributing main has been agitated for the past three years. Its necessity seems to be admitted by all who are conversant with the works. When the daily consumption of water shall exceed ten million gallons, it would seem that the city should not depend entirely upon a single distributing main. Not to speak of the danger of having the supply cut off by accident, the passing of so large a quantity of water through a single 36-inch main will require a velocity so great as to reduce very materially the head in the city. The daily consumption has averaged, for the past year, five and a quarter millions; it is now six millions. The estimated daily consumption for 1863 is seven and one-half millions; for 1864, nine millions. The daily consumption in January, 1865, will very nearly reach ten million gallons. It is well to remember here, that at certains hours of the day, the consumption of water, even for ordinary purposes, is largely in excess of the regular daily consumption, probably one-third greater. It would not be safe to assume that this second main could be laid and ready for use in less time than two years. Thus it appears, that if the laying of this main is commenced the present year, there will for a time, before it is ready for use, have to be passed through the present main ten million gallons per day, and at certain hours of the day this present main will have to deliver the water at the rate of fifteen million gallons per day, to supply the ordinary daily consumption. Hence, as it is desirable to have at command the present available head for protection against fires, the laying of this main must commence the present year.

METERS.

There are, at this time, one hundred and fifty-seven meters in operation.

Ninety-two of	⅝ inch.
Fifty-two of	1 "
Four of	2 "
Eight of	3 "
One of	4 "

Many of these have been in operation more than three years. They were made by Mr. Henry R. Worthington, of this city, and are pronounced to be extremely accurate in their indications; and it is said that they give universal satisfaction to manufacturers and others, whose supply of water is furnished through them. A variety of other meters have been furnished for examination, but none of them were perfect or without some very serious objection.

While mentioning the subject of meters, the following remarks we take entire from the report of Mr. Rhodes, Water Purveyor. They are of much importance.

The amount of water, per capita, as allowed for tax, domestic	27 gallons.
Amount consumed, per capita, domestic	52 9-10 "
Whole amount consumed, per capita	58 8-10 "

In presenting this statement, I feel constrained, as an act of duty, to call the attention of your honorable board to the fact that the waste of water continues to increase to an alarming extent; and I sincerely hope that the statistics I am about to present will produce conviction in the minds of all persons who will carefully examine them, and I cannot but hope that the cordial co-operation of the Common Council will be rendered, to bring about such important changes in the mode of distributing water, as I confidently believe I shall be enabled to prove to be not only necessary for the preservation of the efficiency of the water-works, but also for the protection of the individual interest of the citizens.

The whole number of houses on the piped district is twenty-six thousand four hundred and eighty-one, of which fourteen thousand six hundred and eighty-nine have water. We may say that but little more than half have water. As the tax within the district is the same in both cases, *i. e.*, whether they be supplied with water or not, the important fact appears that we are already receiving nearly all of the revenue that can be deduced from improved property, while the present consumption is certain to be nearly doubled in the future, as a natural effect from supplying the dwellings now unsupplied. From January 1, 1862, to January 1, 1863, the consumption has amounted to one billion eight hundred and eighty-eight millions seven hundred and seventy-two thousand three hundred and seventy-three gallons. When the consumption shall have been doubled, as in all probability it must soon be, unless speedy means be taken to check the waste of water, the large quantity of twelve millions per day will be reached. The present daily average has swollen from three millions one hundred and fifty thousand in 1860, to five millions nine hundred and sixty-eight thousand in 1862. Under the present rates, the fourteen thousand six hundred and eighty-nine dwellings are entitled to use four hundred and seventeen millions nine hundred and one thousand five hundred and thirty-nine gallons per year, yielding a revenue of one hundred and twenty-five thousand eight hundred and thirty-three dollars ($125,833), while they have absolutely consumed sixteen hundred and ninety-seven millions seven hundred and twenty-three thousand five hundred and sixty-four gallons—thus consuming twelve hundred and seventy-nine millions eight hundred and twenty-two thousand and twenty-five gallons per year more than entitled to at the rate of tax paid, and equal in value to three hundred and eighty-three thousand seven hundred and forty-six dollars and sixty cents ($383,745 60). It seems to me, in view of these facts, to be self-evident that a wanton and reckless waste of water is the great evil against which all the force of legislation should be directed, in order to spare our citizens the accumulated expenditures, alterations and extensions which, in other cases, have been vainly depended upon for averting an evil that seems only to increase with every effort made for its suppression. It is well known, that twenty-five gallons per day for each inhabitant is considered a very large estimate for any city. Thirty gallons was taken as the extreme standard of the Boston water-works, in 1848, and it would seem to me that every person will admit that this allowance is so liberal as almost to permit an unrestrained use of the water, and it evidently will of its use, but not of its continual and reckless waste. The warnings annually set forth from the several water boards of this country, through their annual reports to the public, upon the subject of waste, are constant and discouraging. I might give citations, were they not so voluminous, from them, which would satisfy all who would carefully examine them, that the waste must, if not prevented by the strong arm of the law, eventually destroy the efficiency of the best arranged water-works within the power of man to construct, and our tendency is to the consumption of eighty or ninety gallons per day, instead of the proper and very liberal allowance of twenty-seven gallons. Let me apply this ratio to the present number of houses (twenty-six thousand four hundred and eighty-one), and I believe the Common Council will be convinced that sooner or later the strong hand of the law must be interposed to save our works from the reproach of insufficiency, if not of comparative failure. An average of six persons to each house, would only account for a population of about one hundred and fifty-nine thousand, at eighty-five gallons each, would consume thirteen and a-half millions per day, which is about the maximum capacity of the thirty-six inch main to deliver in twenty-four hours, while the quantity of water used is almost entirely taken during a period of twelve hours. This supply would require an additional main of the same capacity of the one now in operation.

With the facts as presented before you, is there a means by which we may escape from so ruinous a prospect? The first and most obvious is a system of strict supervision, conjoined with great care in permitting appurtenances to be used in houses, whose tendency shall always be to prevent waste. Every city has fully tried this, with modifications innumerable, and yet in the face of the best efforts that can be made in this

way, the noble works of New York and Boston would appear to have suffered to an incredible extent. Their main endeavors have been defeated, their supply growing so deficient from year to year as to compel them into enormous outlays for increase; and I am constrained to say, that thus far the developments of my experiences leave but little cause for congratulations. Fourteen thousand six hundred and eighty-nine dwellings have consumed about fifty-three gallons per day for each inhabitant, based upon six individuals to each house. My report of 1860 gave a fraction over thirty gallons, thus it is seen that our progress is exactly parallel with that of other cities. The city of Boston started with an allowance of thirty gallons; the calculated demand at the end of ten years was reached in two years. The quantity used at the end of ten years was five millions more than the calculation of their engineer allowed at the end of twenty years; their estimate of the increase of population meanwhile having proved remarkably accurate. I am therefore impelled to state my belief that all has been done which can be done to restrain the use of water within reasonable limits, unless it be the only remaining plan of measuring it to each consumer can be reduced to practice in a reliable and economical way.

My experience in this direction has not been small nor unsatisfactory. From the first, meters have been applied to manufacturing establishments, and by that means I have no doubt that millions of gallons are saved annually to the city. The whole amount of water used for manufacturing purposes during the year, was one hundred and forty-three millions two hundred and fifty-seven thousand six hundred and eighty gallons, of which one hundred and thirty-two millions one hundred and forty-eight thousand six hundred gallons was furnished by meters, leaving but a small proportion subject to be used exclusively over the required amount by computation. Had I any thing like a proportionate control of the supply of water for domestic purposes, I should feel that the efficiency of the water-works was beyond danger, and their self-support ensured under a much reduced annual tax. In reference to the general use of meters, the point for consideration and discussion is the expense attending their application and maintenance. In point of accuracy of the Worthington meter, I believe that it is no longer a question even by consumers, who derive their supply through them: and for their durability, I will merely state the fact, that there are now in use and in good condition at least fifty, which have been in operation three years, or over, the greater part of which have cost nothing for repairs, and none of them one per cent. upon their cost. And here permit me to say a few words in reference to the experience of gas companies. The value of the article measured is nearly the same. This may appear improbable to many, but the fact is, that water, at three cents per one hundred gallons, is just as costly, bulk for bulk, as gas at two dollars and twenty-five cents per thousand cubic feet. This statement shows that we are dealing with an article of absolute value, like any other merchandise, not free as the air, nor to be had at a nominal expense, but costly and to be used with proper economy. The almost universal failure of all our large water-works to fulfil their original intention, can be traced directly to this popular fallacy. No matter how economical a family may be in the use of every other article for which they are required to pay money, in the case of water they refuse to be restrained by any such considerations. The long and unrestrained use of water, at nominal rates, has left the public mind unprepared for any restriction; this I well know, and yet not one of our citizens interested in our prosperity, as a city, will fail to admit its necessity, unless indeed some other and less objectionable plan can be proposed that will produce the same results.

SEWERS AND DRAINS.

The construction of sewers has been carried forward the present year, but not so rapidly as in the three preceding years. The wants of the more populous portions of the city have been attended to, and the demand for sewers is not necessarily so great as in the first years of the commencement of the system. When the building of sewers was commenced by the department, in 1858, the total length of old sewers, in the city, was less than 7 miles, and this for a city of about 270,000 inhabitants. There had been constructed, under the direction of the commissioners for sewers, up to January 1, 1862, 86 27-100 miles; there have been constructed during the past year 5 77-100 miles—making the total number of 92 4-100 miles since July, 1858; and the total length of old and new sewers at the present time, in the city, 99 miles.

The sewers already built have been found to answer the purpose well. From practice and experience, thus far, it is found that the system meets all the requirements of a perfect drainage, so far as it has been faithfully executed. The pipe-sewers have been found to keep themselves free and clear. It is constantly becoming more apparent, that the wisdom of preparing a plan that should embrace the whole city, has saved the real estate holders vast sums of money, and contributed greatly to the cleanliness and health of the city

During the present year, the 48-inch sewer in Grand avenue, from Flushing to Green avenue, has been built; together with the lateral connections in Green avenue and Ryer-on street, to Fulton avenue. This relieves Fulton avenue, at the junction with Ryerson street, from the rain-fall which accumulated at that point heretofore, and also drains the ponds which have been so detrimental to the health and improvement of all the streets crossing Grand avenue, between DeKalb and Fulton avenues. The whole district between Grand avenue and the streets west of it, which had been sewered before, and north of Atlantic avenue, is now under contract, and will probably be completed the present year.

The 48-inch sewer in Nostrand avenue, from River street to Fulton avenue, is under contract, and is also to be built the present year. It is advisable to commence the sewer in River street from Nostrand to Kent avenue, and thence through Kent avenue to its outlet into the East river, as this is the main outlet for a drainage district of over 2,400 acres, some portions of which require the sewers as soon as they can be built.

The water-pipes have been laid in the Seventeenth ward the present year. It is evident that the water cannot be generally used there until the sewers are built in a portion of the ward. The sewers in Java street, Kent street, and Franklin street, should be built the present year. It will be observed, on comparing the number of miles of water-pipes laid, viz.: one hundred and fifty-six miles, with the number of miles of sewers built, viz.: ninety-nine miles, that about forty miles more of sewers should be built as soon as circumstances will allow, in order to give to all the citizens, now supplied with water, the full benefit of it.

Attention is called by the engineer to one point in connection with the system of sewerage adopted in this city, which seems to have been overlooked by the department having charge of the street cleaning. By the plan of sewerage, sweepings from the streets are intended to be carted away and not allowed to be washed into the sewers. In many wards of the city, the sweepings from the streets and gutters are allowed to accumulate about the street corners, and are washed into the street basins by the first storm, thus frequently stopping them up entirely. This renders the cleaning of these basins more frequent than would otherwise be necessary. The only remedy for this will be, to have the cleaning of the street basins included in the cleaning of the streets, otherwise it costs the city twice the amount to take this material from the basins, that it would to take it directly from the streets; besides, the contractor for street cleaning is paid for taking this same material from the street, which, by his neglect, he allows to pass into the street basins.

COMMISSIONERS OF NASSAU WATER SUPPLY.

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DANIEL L. NORTHUP, *Secretary.*
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PETER G. TAYLOR.

HEADS OF DEPARTMENTS.

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MOSES LANE.

Water Purveyor.
JOHN H. RHODES.

Registrar of Water Rates.
CHARLES W. WILLETS.

Engineer in Charge of Pumping Engines.
ROBERT W. HAMILTON.

DISTRIBUTION OF GAS.

The distribution of the gas from the gasometer is effected, as far as the principal mains are concerned, by means of cast-iron pipes; the smaller pipes, for the supply of houses, are composed of drawn leaden tubes. Copper pipes are dangerous, on account of the production of a peculiar pulverulent deposit, formed by the combination of the metal with some of the ingredients of the gas, which takes fire spontaneously in the air.

In flowing through the pipes, the gas is subjected to friction against their sides, which increases rapidly as their diameter diminishes. As it is very inconvenient to overcome, by a greater pressure in the gasometer, the diminution of velocity caused by friction in the current of gas, it becomes necessary to widen the pipes to such an extent that the velocity in the current of gas at different distances from the gasometer may not sensibly vary, and it is therefore of importance to be able to calculate the effects of friction. Assuming a constant pressure to exist in the gasometer, the resistance caused by friction will stand in some relation to the root of the length of the pipe (l). The quantity of of gas q which flows out depends, therefore, first upon that relation (upon $\sqrt{l}$), and also upon the width, *i. e.*, upon the square of the diameter (d^2), increasing with the latter, and diminishing with the former. According to Prechtl, $q = \frac{d^2}{\sqrt{l}}$, and a tube 316 feet in length allows 400 cubic feet of gas to pass in an hour, when its diameter is one-tenth of a foot. We obtain, therefore,

$$q : \frac{d^2}{\sqrt{l}} = 400 : \frac{0.1^2}{\sqrt{316}}, \text{ whence } d = \sqrt{\frac{q\sqrt{l}}{711000}}$$

The relations between the dimensions of the pipe, the pressure of the gas, and the velocity diminished by the effect of friction, &c., have been made the subject of repeated experiment by engineers, and the practical mathematical formula which is most conformable to the experimental result is, according to Pole—

$$Q = 1350\, d^2 \sqrt{\frac{h\, d}{s\,(l + d)}}$$

In which

Q=Quantity of gas passing per hour in cubic feet.
l=Length of pipe in yards.
d=Diameter of pipe in inches.
h=Pressure in inches of water.
s=Specific gravity of gas, that of atmospheric air being 1.

The results of numerous experiments since made upon coal-gas appear to give on an average about 13 per cent. less discharge than is indicated by the formula. This would require an alteration in the constant from 1350 to 1150. But as the experiments were made only on one pipe, it would be desirable that more experiments upon pipes of variable dimensions should be made before altering the formula.

The above equation may be translated in the following manner:

1. Multiply the pressure by the diameter of the pipe, both in inches.
2. To the length of the main in yards add the diameter in inches, and multiply the sum by the specific gravity of the gas. Divide the product by the result of (1), and extract the square root of the quotient.
3. Multiply the square of the diameter of the pipe in inches by the constant coefficient 1350, and divide by the result of (2). The quotient will be the quantity discharged in cubic feet per hour.

All causes which tend to produce eddies or disturbance of the particles of fluid amongst each other must inevitably check the velocity and diminish the discharge; for this reason sharp bends, contractions, and enlargements, must be avoided as much as possible.

The cast-iron pipes are generally about nine or ten feet long, and are furnished with a shoulder at one end and a mouthpiece at the other. The space between the two is filled with greased tow, which is rammed in, and lead is then melted round the whole, which renders the joint perfectly air-tight. It is still more easy to form a tight joint with the smaller pipes, the leaden tube being flexible and easily soldered. The proper distribution of the gas, as well as the function of the gasometer, render it necessary that there should be

stops in different parts of the mains; stop-cocks answer well enough for the smaller pipes, but are not suited to the principal mains, where they would necessarily be very awkward and excessively large. The more convenient water-valve has been substituted, and by its means a perfect stop is effected without any cock. Leakage in the pipes, which often occurs at bends and corners, is attended not only with loss but danger, for illuminating gas explodes when mixed with air in certain proportions. The fact that such explosions are uncommon, and seldom occur in inhabited rooms, is easy of explanation. The gas, on entering a room, gives warning of its presence by its smell, and becoming mixed with much more air than that proportion with which alone it is explosive, little danger is incurred. In the crevices of walls and ceilings, the probability of an explosive mixture being generated is much greater, and it is generally when gas has accumulated in such parts that the introduction of a light explodes the mixture.—*Ronalds and Richardson's Technology.*

ON THE UTILIZATION OF PEAT, WITH REFERENCE MORE PARTICULARLY TO THE MANUFACTURE OF HYDRO-CARBON OILS.*

By B. H. Paul, Ph. D.

(*From the London Artizan.*)

The application of peat to some useful purpose, is a subject which has, at various times, attracted considerable attention; a vast amount of inventive ingenuity has been bestowed upon it; it has given rise to very sanguine, and I may say, in some cases, very aggravated expectations, and as a natural consequence it has been a source of proportionate disappointment. Notwithstanding the numerous attempts and proposals that have been made for utilizing peat, very little has been done as to enquiring into and elucidating what are really its capabilities and disabilities as a material for use in the arts. But a knowledge of these circumstances is an essential preliminary to any successful application of it, and I hope to be able, in some degree, to contribute to the acquisition of such a knowledge by bringing before this Society the results of several years' practical experience in the prosecution of this subject.

Taking for granted that the existence of enormous deposits of peat in various parts of the kingdom is sufficiently well known, and having regard more especially to its technical value, it will be unnecessary for me to enter into any consideration of the origin and formation of peat, or of the different views entertained on that subject. It will be sufficient for my purpose to consider peat as it exists now; and with regard to this point there are two modes in which it occurs, which I believe to be of importance as regards its application to useful purposes. In one case we find peat deposits in the form of what are called peat-bogs, masses of peat of considerable superficial extent, and generally of great depth, 20, 30, and sometimes upwards of 100 feet deep, where the uppermost layers are of a loose, fibrous, or greasy texture, and saturated with water to such an extent, in some instances, as to be incapable of affording any support to the foot. When the water is drawn off from these bogs by drainage, the peat is generally found to vary in character according to the depth at which it is situated, gradually becoming darker in color, more compact, and having less evident indications of vegetable structure. At the bottom of such bogs, the peat is generally a black mass, of a clayey consistency.

In the other case, we find, situated on the slopes of mountainous country, peat deposits, which are never of very great depth, generally from 12 to 2 feet, and where the peat is sufficiently solid to be walked upon with ease. In these deposits the peat is of a more uniform texture and character throughout, than in bogs, although there is always a greater or less difference between the peat at the surface and that at the bottom. These deposites of mountain peat are very common in the Highlands of Scotland and in some parts of Ireland.

Mountain peat offers very much greater facilities for cutting than bog peat, and it is generally of much better quality. Bog peat, when dried, has very much the appearance of pressed hay; it rarely has a density of more than 300 or 400—water being 1,000—and the cubic foot weighs only from 15 to 30 pounds: it would perhaps be useful to distinguish it by the term turf, from the true mountain peat, which when dried is dark brown or quite black, with little or no remains of plants in it; capable of taking a high polish when rubbed, and of a density greater than that of water, the cubic foot weighing from 53 to 78 pounds.

The method of cutting peat in the Highlands of Scotland is very different from that adopted for cutting peat from bogs. In the first place trenches are opened at distances of about ten yards apart; and, according to the nature of the ground, these trenches are made from 50 to 400 or 500 yards long. After removing the surface sod at the places where the trenches are to be cut, for a width of three feet, along the whole line of the trench, the peat-cutter digs out the peat with a peculiar-shaped tool, in slices of about a foot square and three or four inches thick. As fast as these slices are cut, another man takes them off the peat iron and throws them on the surface, so as to spread them out as much as possible. In this way prisms of peat, measuring three feet in width and depth are cut out at intervals of ten yards, and the number of slices cut in each trench are just as many as a man can throw on both side of the trench without shifting his position except from one end of the trench to the other as the cutting advances.

In succeeding years the peat is cut from the two banks thus formed in each trench, to a width of only 18 inches and a depth of three feet. The advantage of this system of cutting is that there is no necessity for removing the peat by barrows to the spreading-ground, a proceeding which is attended with considerable expense for labor. When the peat is cut is this way from a bank 150 yards long, it will give 75 cubic yards of wet peat, and the number of slices into which this is divided will be about 8,000. Then as the banks are ten yards apart, there are five yards width of drying ground to each bank, or a superficial area of 6,750 square feet to each bank of 150 yards long. Cutting it in this way every year, it would take ten years to remove the whole of the peat to a depth of three feet. As the banks are cut away in successive years, the area of spreading-ground on the surface is reduced, and some of the peat has to be spread at the bottom of the trench, the area of which increases as that of the banks' surface is reduced by the cutting.

The peat, cut to a width of 18 inches and a depth of three feet, from a bank of 150 yards long, is what is called an iron's work, and the 75 yards of peat so cut yields about ten tons of dry peat, so that to cut seven or eight thousand tons of dry peat would require 750 irons' work, or banks about 64 miles in length, and extending over an area of about one-fifth of a square mile. This area of ground would supply seven or eight thousand tons every year for ten years.

The cutting and spreading of peat in this way forms but a proportion of the cost of the dry peat. A far more considerable portion of its cost results from the labor of collecting the dry peat and bringing it to the place where it is to be used. Herein lies one of the greatest difficulties of employing peat on any very extensive scale. Whatever mode may be adopted for collecting the dried peat to one spot for use, the cost of carriage will increase in proportion to the increase in the quantity of peat consumed at that spot. Thus, for instance, in the case of a factory consuming 7,000 tons annually, it would be requisite to carry the peat, on the average, a distance of one-tenth of a mile; if the quantity consumed were 70,000 tons, it would be requisite to carry it an average distance of half a mile, and if the quantity consumed were 300,000 tons a year, it would have to be carried an average distance of two miles, or a mile and a half, inasmuch as the cutting-ground would extend over an area of eight square miles.

The extent to which this advantage affects any particular instance of the use of peat will depend very much on the skill exercised in laying out the ground for cutting the peat and disposing the banks and tramroads, or other means for conveying the peat to the place where it is to be used; but it is a disadvantage which can only be reduced by such means within the smallest possible limits, and which is quite inseparable from the use of peat on a large scale.

Another prominent difficulty attending the use of peat consists in obtaining it in a dry state, fit for use as fuel or otherwise. Mountain peat, as it occurs naturally, contains as much as 80 per cent. of water, even when it has been well drained, and bog peat often contains very much more. Consequently, to obtain one ton of dry peat, five tons of material have to be dug and spread, and four tons of water have to be got rid of by evaporation. When mountain peat is cut in slices, as I have described, and spread out on the ground during dry weather, the drying goes on rapidly, the surface of the pieces acquire a kind of skin, which is not wetted again by rain, and the peat, in the course of a week, is sufficiently hardened to be handled; the pieces are then set up on edge, so that the air may play on both sides, and in the course of six weeks or two months, they are dry enough to be stacked or heaped up. But, unfortunately, peat districts are generally remarkable for a very moist atmosphere and for a great frequency of rain. In the Highlands of Scotland and in the Hebrides on the average there is rain four days out of six, and it is only during the months of May, June, and July that you can expect to have any continuance of weather favorable for drying peat. It is necessary, therefore, to obtain the utmost advantage of that period for the drying of the peat, and to do so, the peat must all be cut before the end of May at latest. On the other hand, if the peat is cut in frosty weather, and becomes frozen, it crumbles to powder when the thaw comes, and for this reason it is not safe to commence the cutting at all before April or even May. As a rule, it might be said that the month of May is the only time available for cutting peat in the Highlands of Scotland, and more especially in the Hebrides, so as, on the one hand, to avoid the destruction of the peat by frost, and on the other hand to ensure the best possible chance of getting it well dried.

Notwithstanding the general moist condition of the air in those places, the boisterous winds which prevail are very efficacious in drying the peat; and if, during the month of May and early part of June the peat has got a certain amount of drying, and a skin has formed on the surface of the pieces, it may be considered safe, whatever kind of weather there may be afterwards. It may then remain on the ground, set up in little heaps, till the autumn, and will get the advantage of whatever dry weather there may be. Of course, even in this case, the quality of the peat will depend on the weather; but if the cutting is not finished by the end of May, there is always less probability of getting the peat in good condition.

It will be evident, from these circumstances that the cutting of peat to supply a factory consuming any large quantity, must be an affair requiring considerable management, so as to get the work done in the short space of time available for it, and the difficulty of effecting this increases in proportion to the quantity of peat required to be procured.

Two men working together, one cutting and the other casting the peat, will, in good weather, get through about one iron's work in a day, equivalent to 10 tons of dry peat, so that if they were able to work every day during May they would cut from 200 to 300 tons of peat; and to get 10,000 tons cut and spread, 100 men would be required for the whole month; and to get 300,000 tons cut and spread would require 3,000 men to be employed for the whole month. It is unnecessary to dilate upon the difficulty of getting such a large number of men together for the work, and of organizing a system for measuring the work done, and carrying on the general supervision of the peat cutting on such a large scale; but I may mention that there are circumstances connected with the habits of the people in these districts, which are in some degree favorable to the carrying out of such an operation. The people are almost all fishermen, and the fishing season does not commence until the end of May or June, so that it would be possible to obtain many of these men before they go to the fishing, and thus the inconvenience of employing a large number of men for a short period would not be so great there as it would be in most other instances. Moreover, these people are accustomed to hutting themselves with no

* Paper read at a recent meeting of of the Society of Arts.

small degree of comfort, in huts or bothies built of the surface sods of the peat, and they live in these, as a rule, throughout the Hebrides; so that a squad of 200 or 300 men find, on the ground where they are going to work, the materials for their encampment, and it is interesting to see the dexterity and quickness with which they construct these bothies.

Having now described the mode of obtaining the peat, and pointed out the two great difficulties involved in the supply of a large quantity of it for the purpose of fuel or for any other application, I will now request your attention to the nature of this material when it has been dried, and in the first instance as regards its application as fuel.

Even in the most favorable seasons, the air-dried peat retains a considerable amount of water—from 20 to 30 per cent.—as will be seen from the following results or analysis of different kinds taken from stacks a year old:

LEWS PEAT.	Air-Dried.	
	Per centage of water.	Weight of a cubic foot.
1. Light brown fibrous turf	40	25 lbs.
2. Blackish brown fibrous peat	26.71	53 "
3. Black peat very dense	25.39	54 "
4. " "	31.60	65 "
5. Brown peat	28.74	71 "
6. Brownish black peat	27.76	78 "

This water cannot be separated from the peat except by kiln drying; but in order to illustrate the effect of this moisture on the value of peat as fuel, I will at first suppose that it has been so dried as not to contain any water. In that state the composition of peat may be taken as generally represented by the following proportions as compared with coal:

	Peat.	Coal.				
		Welsh.	Newcastle.	Lancashire.	Scotch.	Derbyshire.
Carbon	60	88.78	82.12	77.90	78.58	79.68
Hydrogen	6	4.79	5.31	5.32	5.61	4.94
Oxygen	32	4.15	5.67	9.58	9.69	10.12
Ash	2	4.91	3.77	4.88	4.03	2.65
	100					

Combustion, or that chemical process by which heat is generated from ordinary fuel, consists in the combination of carbon and hydrogen with atmospheric oxygen.

The amount of heat produced by the combustion of any kind of fuel depends, therefore, on the amount of carbon and hydrogen it contains. The amount of heat produced by any particular fuel, or its calorific power, is expressed by comparison with the amount of heat produced by the combustion of carbon, which is taken as unity. Hydrogen gas, when burnt, produces an amount of heat three times as great as that produced by the combustion of an equal weight of carbon to carbonic acid. The calorific power of hydrogen is therefore three times as great as that of carbon. The percentage composition of a fuel being known, it is easy to determine its relative calorific power, that of carbon being = 1,000. When the combustible portion of the fuel consists of carbon only, as in coke or charcoal, the percentage of carbon expresses the calorific power or relative fuel value as compared with pure carbon. When the combustible portion of the fuel consists of carbon and hydrogen, the percentage amount of hydrogen multiplied by three and added to the number expressing the percentage of carbon, gives the calorific power of that fuel as compared with carbon; but when the fuel contains oxygen besides carbon and hydrogen, a portion of either or both of these constituents equivalent to the amount of oxygen contained in the fuel, must be regarded as already in combustion with oxygen, and therefore as ineffective for the production of heat. In such cases it is only the surplus carbon and hydrogen, over and above what are equivalent to the oxygen of the fuel, which can produce heat by combustion; therefore, the greater the amount of oxygen in any fuel, the smaller will be the calorific power. In this respect there is a great difference between coal and peat. The presence of a large amount of oxygen in fuel affects the calorific power in two ways, viz., by reducing the percentage amount of carbon and hydrogen, and by rendering a portion of those constituents ineffective for the production of heat. For this reason the calorific power of absolutely dry peat is only 660, while that of coal is from 996 to 903. Hence it will be evident that the maximum capability of peat as fuel is necessarily far below that of coal, even when the peat is absolutely dry. But, as I have already pointed out, that degree of dryness cannot be attained except by kiln-drying; and the ordinary air-dried peat of good quality contains one-fourth its weight of water. Here then is a further reduction of the calorific power of this substance, by one-fourth, or to 495; about one-half that of coal.

In some case where peat is needed for fuel it is essential to have it quite dry, and then it is worth while to kiln-dry it; but there is no saving effected by so doing. The 25 per cent. of water separated by kiln-drying requires for its separation a determinate quantity of heat and a proportionate consumption of fuel, which is equally consumed without useful effect, whether the peat be used as fuel in the air-dried state, or whether it be kiln-dried before it is used.

These simple considerations will be sufficient to show what a palpable delusion it would be to suppose that peat could possibly be in any way equal to coal in fuel value.

The greater bulkiness of peat as compared with coal is another circumstance which operates against its application as fuel. The average of coal has a density corresponding to 80lbs. to the cubic foot, while air-dried peat has a density corresponding to only 64lbs. to the cubic foot. A cubic foot of coal, in the state in which it is used, contains about 60lbs., whereas peat in the same way weighs only 30lbs. to the cubic foot; so that with only half the calorific power it takes twice the space, and to produce a given effect with air-dried peat, it would require twice the weight and four times the bulk of the coal to produce that effect. Hence has arisen the idea of compressing peat. It is notorious that no success has attended any of the attemps to carry this idea into practice, and that this should be the case is very easily intelligible. Absolutely dry peat of the very best quality has a fuel value of 660 as compared with coal at 960; in order, therefore that equal bulks of coal and peat should have the same fuel value, a cubic foot of peat must contain nearly one and a half times as much in weight as a cubic foot of coal, or nearly 116lbs. to the cubic foot, corresponding to a density of 1800. Whether such a compression of peat is or is not possible in practice I will not pretend to say, though I consider it very improbable: and even if it were effected so as to be of practical utility, there would still be the disadvantage attending the use of peat as fuel, that its calorific power would be only two-thirds that of coal, and that one and a half times as much must be used to produce the same effect.

As regards the use of peat for fuel, it now remains only to consider what are the circumstances under which it can be used for this purpose, and under which there is an advantage in using it rather than coal. I can best illustrate this by a case within my own experience. During the last four years I have had occasion to manufacture a large quantity of bricks in one of the Western Islands of Scotland, and for that purpose required fuel for raising steam to drive the brick machinery, and for burning the bricks. Coal could be delivered at the port of Stornoway at about 18*s.* per ton, and as the works were at some distance inland, there was a cartage amounting to 4*s.* per ton, making the cost of the coal 22*s.* per ton. But I found that the peat, of which there was abundance close to the works, was capable of raising steam well, and of being used for burning the bricks, and that, taking it to have only half the fuel value of coal, and even with very imperfect arrangements for bringing it in from the moor, I could for 8*s.* put down at the boiler or at the kiln a quantity of peat equivalent to one ton of coal, thus making a difference of 14*s.* between the use of a ton of coal and the use of peat equivalent to it. As the burning of the bricks required about half a ton of coals per thousand, this was equivalent to a saving of 7*s.* per thousand in the cost of the bricks. In this case, therefore, there was an unmistakeable advantage in using peat as fuel, and the advantage would have been still greater if there had been a more efficient means of bringing in the peat from the moor. In the case to which I now refer, this cost as much as the peat itself cost on the moor, or about 2*s.* per ton.

In the town of Stornoway, however, it is found to be more advantageous to use coal at the gas-works, and as fuel for the steam-boiler at the slip, and for general purposes, since there is no organized system for supplying the peat from the moors, which are three or four miles distant from the town, the consequence being that the gathering and cartage of the peat costs as much as 4*s.* or 5*s.* per ton over and above the cost of cutting and drying, or in all 6*s.* or 7*s.* per ton. At that cost it is evidently better to use coal, which is much more easily obtained, and which, being double the value of peat, is not much dearer.

From my own experience of the use of peat as fuel, I consider that wherever it can be had on the spot, and with a fuel value one-half that of coal can be put down at a cost of 4*s.* per ton at the place where it is to be used, it may be advantageously substituted, when coal, under the same circumstances, costs more than 10*s.* per ton; but if coal can be had for 10*s.* per ton, or less than that, there would be a disadvantage in using peat.

When the place where peat is to be used is far distant from the moor where it is cut, the cost of carriage, under the most favorable circumstances, amounts to twice as much as the carriage of coal, because the fuel value being only half that of coal, two tons of peat are required for one ton of coal. This necessarily limits the use of peat as fuel to places near the moors where it is cut.

(To be continued.)

PETROLEUM GAS.

A correspondent of an English publication, writes the following letter on petroleum gas:

Noticing the remarks upon gas from petroleum in your paper of the 16th inst., and the results there given, as having been obtained from experiments made on lighting an hotel in Toronto, induced me to compare these with notes which I took on the 15th of September last, at an hotel on Lake George, in the State of New York, where oil is used for lighting up the establishment.

My notes were as under, and, such as they are, they are at your service:—

Gasholder, 12 feet in diameter by about 7½ feet in depth; and to fill it with gas 6 gallons of oil are used.

Oil costs in New York 20 cents per gallon.

Two retorts are employed, and the time required to fill the gasholder is 4 hours.

Retorts, 14 inches in diameter by 12 inches deep, placed for heating, into a portable cast-iron frame, very much the same as an ordinary American cooking-stove.

When at work, each of the retorts has a basket placed into it filled with small blocks of burnt limestone.

The basket and its contents occupy about two-thirds of the interior space of retort.

Retorts can only be charged from 20 to 25 times, until "used up."

The oil is allowed to flow direct upon the limestone placed inside of the retort.

The gas passes off into a square vessel, which serves as a condenser and tar-well.

Water is sometimes used at the end of the charge, for the purpose of clearing out the pipes by the steam made from it; and arrangements are made for allowing the steam to escape, without going into the gas holder.

Taking 750 feet as the contents of the gasholder, then, 8 gallons of the oil used would produce 1,000 feet of gas, which, at 10d. per gallon, gives 6*s.* 5d. per 1,000 feet as the cost for oil alone.

I may notice, that it was stated a great difference was found in the quality of the oil for gas-making, and "*prepared oil*," is in note made upon the spot. In any case, this may account for difference in the quantity used at Toronto—namely, 11 gallons per 1,000 feet of gas.

The Gas at Lake George Hotel did not at first attract my attention in any way, and would have passed unnoticed had I not been informed that it was made from rock-oil. The result of the after-examination, as fixed upon my mind at the time, was: that the

gas was white and clean; and, also, from the manner in which the unprotected jets were deflected by the slightest current of air, I concluded that it was very light, and a large quantity of it was being consumed; and that, taken altogether, it was not equal to Glasgow gas—rather a *Scotch conclusion*, you will probably think.

Whilst upon this subject, it may be mentioned that about the same time I visited the oil-springs at Black Creek, Lambton county, Canada West.

Although only there for a few hours, from the kind attention of a gentleman resident at the place, who took me direct to the most valuable of the springs, and from the ready way in which questions regarding them were answered by the proprietors, the short visit was much more satisfactory than there was reason to expect.

As you will be aware, the area over which the oil-bearing rocks extend in North America has been estimated at many hundreds of square miles. This estimate is founded, in all probability, upon correct geological data; but these, it may be presumed, are somewhat scanty, the limits of observation being so much curtailed by the general flatness of the country, the depth of the alluvial covering, and the density of the almost continuous primeval forests.

Leaving the probable extent to be thecrized upon by those who consider themselves competent to do so, I will revert to my notes, which, perhaps, may serve you as the vehicle for some passing observations on the subject.

The oil-springs upon Black Creek are about twelve miles south of Wyoming, a station upon the Great Western Railway, Canada West, between London and Sarnia, where the railway terminates, at the southern extremity of Lake Huron.

For many miles before reaching Wyoming station—and generally from Wyoming to the oil-springs—the country is almost entirely one dreary flat of forest land: streams there are none, and, where water is seen, it is stagnant and muddy, as it creeps sluggishly through the pools and lower ground, which mark the course of the winter rivers.

The general flatness of the district is farther evidenced by the fact of these rivers overflowing their banks in the rainy season and flooding the country, at intervals, for miles.

Good water, we were informed, could scarcely be found anywhere in this neighborhood; and, although the wells sunk yielded clear spring water, it was sulphurous (?) and unfit for use.

The "Black Creek" is well named, the fluid which fills it being dark, dirty, oily, and disagreeable-looking in the extreme. Adjacent to it, on the rising ground, is the village of Oil Springs, with its printing-office, "Oil Springs Chronicle," planked street-road, hotels, oil-refiners, and timber dwellings for from 1,500 to 2,000 inhabitants, where three years ago there was scarcely one deserving the name.

Many years ago, I was told, the oil was collected at this place by the wandering Indians, from the surface of the still waters of the creek, by spreading their blankets upon them, and wringing out the oil which these absorbed, for after-use. Next, it was collected, where seen oozing out, at the surface, as it seems to have done under particular circumstances.

The next stage was well-sinking, through the stiff alluvial clay, to the top of the clay-beds in their natural position, and using a pump, to raise the oil-feeders of the well to the surface.

I am not aware how the flowing wells were first discovered: probably from one of these surface-wells having been put down upon a ridge of the underlying rock, and, the oil being absent, a bore was put down into the rock, as a last resort—but certainly last of all—the discovery was made that in certain places, on penetrating the rocks underlying the deep surface, by a bore or otherwise, the fountain of the oil-flood is reached. The work to be done after this is simple enough. A tube from the surface is inserted into the bore-hole, sufficiently far down to admit of a joint being made which will resist the pressure upon it when the oil flows off through the tube, 8 or 10 feet above the surface of the ground, and that, with a stop-cock and cistern, completes the "fittings" of a flowing oil-well.

In September last, from 15 to 20 of these wells had been discovered. At the principal one of the district, the oil and gas, rushing upwards through a 2-inch pipe, were, at the height of 10 feet or thereby above the mouth of the well, checked by bends in the pipe, and made to flow downward perpendicular into a cistern.

The discharge of oil may not have been what was due to a 2-inch opening; but it was diffused at the outlet so as to fill it completely, while it issued forth with a slightly hissing sound.

On lower ground, about 60 yards from the well above noticed, is one 178 feet deep. The section kindly given by the proprietor, is as under:

Surface, composed chiefly of stiff clay, with boulders of sandstone, &c. . .	50 feet
"Soap-stone," light-grey clay-beds, with shells of various kinds.	128 "
"Hard band"—rock producing the oil,	178 feet.

The flow from this well was taken off by an inch tube, flowing horizontally into a cistern, from a short distance. At the discharge, the tube was about half filled with the oil, which flowed quietly from it.

The well first noticed (with the 2-inch tube) is about the same depth as the above.

In addition to these, two others were being sunk, at intervals of about 60 yards, upon different land-claims.

The generally-received opinion is, that the oil is lodged in the cavities of the lime-stone rocks, which are interstratified with the clay-beds found in boring under the surface.

These beds are, in some instances, almost a conglomeration of marine shells—familiar to every one who has examined the clay-beds in connection with the limestones of the ower coal-formation in Scotland.

Whilst the geological area of the oil-bearing-rocks is understood to be a very large one, the fifteen to twenty flowing wells of the "Black Creek" are all sunk within an area of from two and a half to three square miles; and in the neighborhood may be seen where more than one unsuccessful trial has been made and abandoned. Still, it must not be supposed that the extent of the oil country is known, or its limits at that place in any way distinctly defined—as those springs farthest removed from the first discoveries are not surpassed by any of the district.

It was stated in September last that 500 barrels per day were being sent from the springs to the railway. Each of these barrels contains 40 gallons, and the cost of conveyance to Wyoming is 37 cents per barrel.

The crude oil could at that time be purchased at the springs for 25 to 30 cents per barrel; it is now stated that sales have been made at 75 cents per barrel, which is more like its value.

Whilst the origin of the oil is a matter of doubt, and the subject of conflicting theories, on one point these theories are one—namely, that the first cause which produced these reservoirs of oil is not now at work, and once exhausted, like our coal-fields, they are exhausted for ever. It is not a matter of surprise, therefore, when we see four wells sunk at 60 yards, or thereby, apart, to learn that some of them have ceased to "pour out rivers of oil;" and, if it were possible, less waste of it would be wisdom.

After having seen the oil-springs, and snatched the little information regarding them and the district which is here given, the mind naturally propounded the question—How did the oil come to be there? The absence of the coal-measures, and of all indications of volcanic agency, at a near or remote era, within even a distant neighborhood, whereby the coals might have been quietly distilled, and the products stored up for future use, completely unsettled any kind of theory previously entertained upon the subject.

In this wandering state of mind, the map was often consulted, and the characteristic features of the land which separates the Lakes Huron and Erie was considered. With all the little knowledge which could be brought to bear upon it, giving weight to the circumstance that the district where the oil-springs abound has made a narrow escape from being lake also, and having dismissed the coal theory, a kind of shell-fish and whale-oil was the next best that could be imagined to meet the case.

To my great astonishment, I found afterwards, that the theory which I put forth in my distress, had been seriously entertained and advocated; and, seeing nothing better, I "go in" for the whales, too.

The residuary products from the oil, which I saw used, and the effects of making gas from it, at a low heat, are the same as when rich gas-coal is similarly treated. How it is with the Canadian oil in this respect, I have not learned; neither am I aware why it only brings half the price in the oil market.

Before closing this letter, I should say that I marked with satisfaction the manner in which the crude oil is refined at the extensive works put up for that purpose near the "Black Creek," whereby the disagreeable odor is *entirely removed*, and the oil, as prepared for the market, is perfectly clear and colorless.

There were no secrets, every thing was open, and explanations given when asked, winding up with an offer to show that the oil used for lighting would not explode at a very high temperature.

I must now conclude, although I feel that I have not yet exhausted the subject, in the rambling way I have gone into it. When I commenced this, I calculated upon giving you all I had to say, on a page of note-paper, and to that dimensions you can restrict it if you so think fit.

Ammoniacal Liquor of Gas-Works.—Mr. A. Croll, of London, proposes to avoid the inconvenience and annoyance arising from the treatment of ammoniacal liquor of gas-works in the following manner:

Steam, from a suitable boiler, is conveyed into ammoniacal liquor contained in a suitable closed chamber, and the combined vapor and steam resulting are conveyed from the upper part of this chamber into other ammoniacal liquor contained in another closed chamber, placed somewhat higher than the preceding, in order that, as the ammoniacal liquor in the previous chamber becomes spent, it may be supplied from the second; and, if desired, other number of such ammoniacal chambers may be employed. From the last ammoniacal chamber the vapor resulting, combined with particles of steam, is conveyed into a closed compartment or chamber of a vessel containing acid, adapted to the salt of ammonia desired to be obtained. Thus, supposing the salt desired is sulphate of ammonia, then the last chamber will contain sulphuric acid, and it is at its upper part divided into two compartments, one open at the top, the other closed by a cover, and a partition dipping below the surface of the acid liquid therein and below the mouth of the pipe conveying the vapor and steam thereto from the last ammoniacal chamber. Any vapor arising from the closed compartment of this vessel is conveyed into similar acid in another closed chamber used as a reservoir. From the upper part of this last closed chamber the sulphuretted hydrogen liberated is conveyed to the furnace supplying an oil of vitriol chamber. By these means economy and the avoidance or great mitigation of the inconvenience and annoyance arising from the treatment of the ammoniacal liquor of gas works are said to be secured.

Explosion of Gas on an English Steamer.—The iron screw steamship *Battalion* of 500 tons, belonging to Mr. W. Laing, of Newcastle, was blown up by an explosion of gas, while off Plymouth, on March 8th. She left Cardiff on the 5th of March, with a cargo of 800 tons of steam coal, and on her passage encountered some very rough weather. About half past five o'clock in the morning, when 8 miles S. S. W. of Eddystone, the mate, who was in charge of the watch, sent three of the crew to get up a spare sail from out of a store-room that was parted off from the hold by a wooden bulkhead. On the store-room hatch being taken off, one of the men went down for the sail, and had an open lamp passed down to him. During the passage, it appears a large quantity of gas had evolved from the coal, and, the hatches being all fastened down in consequence of the bad weather, and no other means of ventilation provided, had accumulated in the hold. Directly the lamp was passed down, the gas took fire, and the explosion was the consequence. The whole of the hatchways were blown out fore and aft, and either blown to pieces, or blown overboard, considerable damage being done by the scattering of the *debris*. The mate had a very narrow escape from being blown overboard from the bridge, and had his face seriously injured. Three of the men were also severely burned.

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C. ELTON BUCK, ... EDITOR.

FRIDAY, MAY 1, 1863.

While the last number of the JOURNAL was in press, information reached us that the Citizens' and the Brooklyn Gas-Light Companies had effected an amicable arrangement of the difficulties under which they had been laboring, and had pledged each other to confine themselves to the limits of certain districts, where both would have spheres sufficient for a large and steady expansion of business. Rumors that negotiations were pending between these two corporations had been flying about for some days prior to the consummation of the arrangement, but as these rumors took a very indefinite shape, we did not even allude to them, preferring that when the time to chronicle the settlement of the contention should come, to obtain such data from official sources as to place the facts before our readers without fear of contradiction.

By the agreements entered into by these two corporations, the old company are to confine themselves to the limits of the district bounded by Atlantic and Flatbush avenues on the south and southeast, and running north to the boundary of the old city proper, touching the district of the Williamsburgh Gas-Light Company. This district also extends eastwardly to the limits of the city—shown in the irregular dotted line on our map of Brooklyn, published on page 297 of this volume. It will thus be seen that the old company light the most densely populated part of the city, and that their district is quite large enough for a company of their capital to attend to with profit either to themselves or their consumers.

The warfare which the Citizens' waged upon the Brooklyn Company, while each was struggling to maintain the ascendancy, convinced the latter that they had no insignificant rival; and the shifts the old company were put to in order to be equal to the contest, showed striking evidence of the hold which the opposite company had taken upon them. Being convinced that an arrangement looking to a settlement of the warfare between the contending parties must offer to the new company some substantial reward, the directors of the Brooklyn most unexpectedly showed the sagacity to offer a district of which any company might be proud, and which the Citizens' have just entered into—the full possessors. This district comprises all that portion of the city of Brooklyn lying south and east of Atlantic and Flatbush avenues. It is fully twice as large as the district of the New York Gas Company and quite the size of that of the Manhattan. It comprises no less than 35,000 building lots, from which some idea may be formed of its extent. This territory is included in the Sixth, Eighth, Tenth, and Twelfth wards. Of these the Eighth ward is as large as five or six others, and will probably be, ere long, divided up into other wards, in point of size more nearly resembling those adjoining it. By the census of 1860, these wards comprized a population of 68,212. They would now, perhaps, number 72,000 inhabitants, or but 24,000 less than was contained in the whole city of Brooklyn in 1850. In the Twelfth ward are contained the immense Atlantic docks and stores and a large number of extensive manufactories; while in the others, besides numerous factories of various kinds, are rows upon rows of dwellings, from the elegant mansion of the merchant prince to the poorest class of tenement houses. The improvements and extensions which are taking place in this district insure a steady increase of business, and in this respect we regard the prospects of the Citizens' Company as flattering in the extreme. In their district they obtain the lighting of about 1,000 public lamps.

Although the arrangement for the districting of these two companies was made more than two weeks since, the formal consummation of the contract was not observed until the night of the 21st ultimo, when the district of each company was lighted alone by its proper owner.

By thus burying the hatchet and smoking the pipe of peace, the stockholders in both of these companies are benefitted by the sudden rise in the value of their shares. The stock of the Citizens' Company had been selling pretty freely at the Board of Brokers and on the street at 100 to 101¼. On the day when it was announced that the arrangement for districting had been completed, it rose to 130 to 132½, at which price it has remained since. The shares of the old company have advanced in about the same ratio.

But while the stockholders of the old company will rejoice at the appreciation of their securities, brought about by this coalition, what will the consumers who have been supplied with gas at $1.25 per thousand have to say to the matter? The astute directors who proposed the sliding scale of prices, just to ruin the opposition company, will have to shoulder a burden of public odium which will be anything but pleasant to bear. Murmurs loud and deep will undoubtedly be uttered against them, and they will reap the reward of their folly in the unmistakeable evidences of distrust which their attempt to cajole the public into maintaining a monopoly of one of the necessaries of life has caused. May they for the future be wiser men.

MESSRS. VAN KIRK & Co.—We have lately examined some of the gas-fixtures made by Messrs. Van Kirk & Co., of Philadelphia, which, in point of design and beauty of finish, cannot easily be excelled. This firm are widely known, not only in this country but in Europe, where the excellence of their articles is universally acknowledged. Their line of business comprises, not only gas-fixtures and chandeliers in all their details, but an endless variety of lamps, candlesticks, and all appliances pertaining to artificial light.

MESSRS. DIETZ & Co.—We refer to the conspicuous advertisement of this well-known house which appears on another page of the JOURNAL. The reputation of Messrs. Dietz & Co., both at home and abroad, is a sufficient guaranty of the substantial character of their work. Since such vast quantities of petroleum have been exported from this country to Europe, American lamps have likewise found a very active market abroad, and those manufactured by Messrs. Dietz & Co. have found their way into almost every quarter of the globe.

A GOOD REASON.—The principal reason urged by the Manhattan Gas-Light Company against new companies in this city is, that there is no *Roome* for any more. Not a bad reason, by the way.

ANSWERS TO CORRESPONDENTS.

J. E. S., of Pa.—*Your surmise is correct. You had better be quick in your movements, as others are pushing forward in the same direction.*

L. B. T., of N. J.—*The article on coal-gas in Ure's Dictionary (last edition) was written by Dr. E. Frankland, a very eminent authority. Dr. F. also wrote the chapter on the Chemistry of Coal-Gas in the last edition of Clegg.*

C. B. E., of Mass.—*It will take about two months.*

J. B., of N. Y.—*The series will be continued in our next number. We do not know why the author allowed so long a time to elapse. We have heard but one opinion of the papers—that of high commendation.*

GAS-BURNERS.

Scarcely anything connected with the subject of gas-illumination has commanded more attention than the means whereby gas may be burnt to the best advantage; and although the greatest ingenuity has been displayed in the construction of many of the burners which have at different times been invented, yet none of them possess that universal applicability for which they have in most cases been so highly vaunted. The reason of this is obvious: different kinds of gas require different forms of burners, in order to effect perfect combustion. As a rule, it may be stated that the rich cannel gases are best consumed from burners with very fine apertures; while the poorer gases—namely, those which contain less than five or six per cent. of condensible hydro-carbons—are burnt with most advantage from larger apertures. Again, in the former case, provision should be made for a large supply of atmospheric air, as by spreading out the flame by means of an internal button, or by using tall glasses; whereas in the latter case, the very opposite condition should be observed. It is manifest, therefore, that no single burner can be constructed so as to secure both of these requirements; and, consequently, that any burner which is well suited for one kind of gas, is altogether unfit for the other.

Another point of importance is the following: that when several jets issue from the same burner, and blend together or coalesce, the light is always improved; for it is the property of one jet to assist another by exalting its temperature; and thus a greater heat and a brighter flame are the result of the union—more light being given out than is the sum of the individual jets. It is on this account that the Argand burner, the fish-tail, the Gaumont, and the Gardner burners have obtained the preference over many other forms of burners.

Lastly, it may be stated, that in whatever way gas is consumed, the maximum effect, as regards its illuminating power, is always produced by burning the gas just short of its smoking point: for if it be burnt with too much air, the particles of carbon are consumed; and we thus obtain less and less light until the flame becomes a pale blue color. On the other hand, if it be burnt with too small a supply of atmospheric air, the particles of carbon will not be sufficiently consumed, and they will escape as soot—thereby cooling the flame and making it of a dingy yellow tint. The object, therefore, should always be to burn the gas in such a manner that the particles of carbon may be first intensely heated, so as to produce a white light; and then, as they reach the exterior of the flame, they ought to be consumed entirely so as to avoid the evolution of soot.

CORRECTION.—We are reliably informed that the late firm of Harris & Brother, consisting of Andrew Harris and J. W. Harris, has been dissolved. Mr. Andrew Harris, the senior partner of the old firm, has established himself in the meter business, under the style of Harris & Co., at the northwest corner of Thirteenth and Cherry streets, Philadelphia. We refer our readers to the advertisement of Messrs. Harris & Co., which appears in its appropriate place in the JOURNAL.

BOGHEAD COAL.—The celebrated Boghead coal occurs in the highest part of the Scotch coal fields, in about the position of the slaty band of ironstone. Its range is not more than three or four miles in the lands of Torbane, Inchcross, Boghead, Capper's, and Bathvale, near Bathgate, in the county of Linlithgow. Its thickness varies from 1 to 30 inches, and at the present rate of consumption—from 80,000 to 100,000 tons per annum, it cannot last many years.

RECENT ENGLISH PATENTS.

Among the patents reported in the last number of *Newton's London Journal of Arts and Sciences*, we notice the following:

Arthur Warner, of London, has obtained a patent for *purifying coal-gas*, for which purpose the patentee employs the cinders or oxide of iron obtained from puddling, re-heating and refining furnaces used in the manufacture of iron, by which means not only is the sulphuretted hydrogen removed, but the gas is also deprived of its carbonic acid and ammonia. The cinders or oxide of iron obtained from the furnaces of iron works are first ground and stamped and sifted through sieves with holes, by preference, of about one-eighth to about one-sixth of an inch square. If the cinders or oxides have much dirt or impurities mixed with them, they should be washed before used. The sifted oxide is used in what are called dry lime purifiers, and generally in a damped state, but this is not essential. When the cinder or oxide of iron is used for the first time to purify coal-gas, the sulphuretted hydrogen is not so fully and effectually acted on as when using hydrated oxide of iron, such as is now very largely employed, and it is only when the cinder or oxide from the furnaces of iron works has been further prepared that it fully and effectually acts on the sulphuretted hydrogen of the coal-gas which is being purified thereby; hence it is desirable, when using a quantity of such cinder or oxide for the first time, to combine it with a quantity of other like cinder or oxide which has been before used, and has been subsequently further prepared by the action of atmospheric air. After the cinder or oxide has been used for a time, and the power of purifying gas has become no longer sufficient for the purpose, it is removed from the purifiers and made up into heaps in the open air till it becomes heated, when the cinder or oxide is to be spread and turned over from time to time until it becomes again suitable for use.

The cinders or oxide of iron obtained from the furnaces of iron works, thus prepared, not only retain the property of removing carbonic acid and ammonia, which they are found to possess when used in the first instance, but they are rendered more effective in removing also the sulphuretted hydrogen from coal gas.

George John Yates, and John William Ward Tindall, of Liverpool, have obtained a patent for *a process of deodorizing paraffin, coal, pitch, rock, and other like oils and hydrocarbons.*

In treating paraffin, coal, pitch, rock, and other mineral oils and hydrocarbons, according to this invention, in order to deodorize such oils and hydrocarbons, and by so doing give to them a more pleasant odor, such oils are subjected to the action of certain substances at suitable intervals of time, as hereafter explained.

In those cases where oils contain paraffin, four ounces, by weight, of commercial sulphuric acid is added for each gallon of the oil to be treated. The sulphuric acid is simply run into the oil contained in a suitable vessel; the oil is then allowed to stand for about ten minutes, when heat is to be applied to the oil so as to raise its temperature to about 115° of Fahrenheit. This temperature is retained for about ten minutes, when the application of heat may cease, unless the temperature should fall materially during a period of about one hour and forty minutes, during which time the oil is kept well stirred. If the temperature fall, then it is desirable that heat should be again applied to keep up the temperature as near as may be to the degree above mentioned. At the end of this time, the oil generally will have ceased to give off offensive pungent and choking vapors; if such should not be the case, the stirring is to be continued for a further time, and, if necessary, more acid added. One and a half ounces by weight of nitric or nitrous acid to each gallon of oil is now to be added, and the temperature is to be allowed to fall to about 105° of Fahrenheit, and to be kept as near as may be to that temperature for about an hour: the oil is to be kept well stirred. A pint and a half of urine is now to be added; the oil is to be stirred, and maintained at the temperature of about 105° for about half an hour, when at the rate of one and a half ounces by weight of commercial hydrochloric acid is to be introduced, continuing the stirring, and the temperature of about 105° during another hour, at which time, in order to bleach the oil, two ounces of chloride of lime for each gallon of oil are added and stirred in, or in place thereof one pound of fullers' earth or clay. If the oil is to be immediately distilled, the whole mixture is placed in a still such as is ordinarily used in distilling such mineral oils and hydrocarbons, and the same is to be distilled in the usual manner. If the oil is to be stored or to be sent to a distance without first undergoing distillation, the oil is to be well washed in water, preferring for this purpose sea-water; after which the oil is to be placed in suitable casks, and may be used in this state for some purposes; or the oil purified, as above described, may be distilled at any time.

When treating like mineral oils and hydrocarbons which do not contain paraffin, it is found desirable to increase the quantity of chloride of lime to four ounces by weight to each gallon of the oil; and stir in four ounces of animal charcoal to each gallon of oil, and let it remain half an hour before applying the nitric or nitrous acid, as above explained; in other respects the process is conducted as above described.

The patentees claim "the combined process herein described."

PREPARATION OF ALCOHOL FROM COAL-GAS.

When we first saw in the newspapers the announcement that "a young French chemist had discovered a process by which alcohol could be made from coal-gas with an economy of 60 per cent. over the methods now in use," we confess we felt proud of being connected, however humbly, with a science capable of such marvels.

Knowing what had been done for the chemistry of the alcohols by men bearing such names as Hennell Liebig, Dumas, Gerhardt, Wurtz and Berthelot, not to mention a host of others, our feelings gradually merged into surprise that it should be reserved for an unknown name to acquire such lustre at one leap. Nevertheless, so authoritative was the announcement that we did not question the fact, but patiently awaited the unveiling of the mystery. Our readers will guess our chagrin when we found that the process was not only not new, but that it was only an attempt to apply in practice the method foreshadowed by Hennell and realized by Berthelot. That it was, in fact, to hydrate olefiant gas by the agency of sulphuric acid.

That sulphuric acid is capable of fulfilling the paradoxical functions of hydrating olefiants, and yet of dehydrating alcohols, according to the conditions of the experiment, we at once admit; and we doubt not that by operating on a sufficiently large scale, alcohol might be prepared by a modification of Berthelot's process in quantity; but that it could be done with an economy of 60 per cent. over the methods at present in use we do not for an instant believe.

Unfortunately the process is not one the economy of which can be tested with the ordinary resources of a laboratory, and we can only therefore found our judgment upon the evidence afforded by the published specification.

M. Cotelle, the patentee, employs several modes of producing intimate contact of coal-gas with the sulphuric acid. The first is by means of a pump to discharge the acid in the form of rain into a leaden receiver containing the gas; the second is a more complex method of operating, but on the same principle; the third is to procure absorption by pressure, as in preparing soda-water, and the fourth consists in placing the sulphuric acid in the form of vapor in contact with the gas. The details cannot be given without engravings, and we must therefore refer those of our readers who desire to study the process to the patent.*

The patentee assures us that "except losses which can never be prevented in great concerns, the sulphuric acid that is employed may serve almost indefinitely." To carry out this, it is proposed after diluting the acid which has combined with the olefiant gas, to distil it to obtain the alcohol, and then to concentrate the diluted acid to the strength required to enable it to act on fresh quantities of gas.

We do not for a moment deny that by proper management of the absorptive apparatus the olefiant may be dissolved in the acid, but we greatly doubt whether more than a very small portion of the dissolved gas becomes converted into alcohol on subsequent dilution. Moreover, we conceive that on concentrating the acid much loss will be incurred, owing to formation of sulphurous acid from the carbonaceous matters, which are, we think, sure to remain with the acid.

The cost of the fuel required to concentrate the highly diluted acid to a state fit for operating on fresh gas will also be considerable.

When we consider also that it will be necessary to have pumps unceasingly at work with sulphuric acid of the strength known as pan acid, and of a density therefore of about 1.767, it must be admitted that "wear and tear" of machinery will be a not unimportant item in the expenditure of the "Company Cotelle."

Taking the above objections only, and disregarding the prejudice which will certainly be felt against the employment of coal-gas spirit for anything but manufacturing processes, we must admit that we have no faith in the practical utility of M. Cotelle's patent. The specification, moreover, shows no ingenuity; the modes of procuring contact between the acid and the gas are merely those which would suggest themselves to any one giving even a very small amount of attention to the subject, and they constitute the only part of the patent upon which M. Cotelle had the opportunity to exercise his talents, inasmuch as the chemical part of the process had been done previously by others.

Some of our friends have felt alarmed lest to their numerous delinquencies wine merchants should add yet another—the sophistication of wines and spirits with M. Berthelot's hydrated olefiant gas. Let them be tranquil; the chances of such an adulteration being profitable, at least for some years, are very remote.—*Chemical News.*

* 1862, July 19, No. 2062.

HOBOKEN, N. J.—A new gas-light company has been formed here, and will go into operation immediately. The Jersey City company, which has heretofore supplied Hoboken with gas, did not relish the loss of so good a customer, but they behaved very sensibly about it, regarding it as one of those little accidents to which the best families are liable. There was no groaning, or threatening, or frantic denunciation. They came squarely up to the spectre, and finding it had bone and sinews the same as themselves, they shook hands, took some stock in the new enterprise, sold them the pipes lying in Hoboken, and all parties are the best of friends. The new company starts with a capital of $100,000, of which the Jersey City Company holds $20,000, some of the Manhattan officers about as much more, Mr. Edwin Stevens $30,000, and the remaining $30,000 is scattered throughout the place.

WARREN, OHIO.—A bill has been introduced into the Ohio Legislature to authorize the town council of Warren to levy a tax for the purpose of purchasing, building or owning gas-works. This looks very much as if the people of Warren were anxious to try the experiment of a municipal gas-works. They had better let well enough alone.

GAS DEVICES FOR ILLUMINATION.—It is said that the well-known firm of Lambert Brothers, of Walsall, Staffordshire, England, drilled for the 10th of March last, more than 400,000 gas-jets, which would burn more than 500,000 cubic feet of gas per hour. These were used at the grand illuminations in honor of the marriage of the Prince of Wales. The Messrs. Lambert Brothers are widely known as probably the most extensive manufacturers of gas apparatus in Great Britain. Their advertisement will be found in another column.

STREET ILLUMINATIONS AND DECORATIONS.—The London *Builder* says that the council of the Society of Arts have appointed a strong committee to consider and report what awards may be offered by the Society for practical suggestions to improve street illuminations and street decorations for *fetes*. The Committee will probably recommend the offer of valuable premiums for the best examples of different systems of illumination, for new modes, and perhaps, for the best essay treating of the subject as a whole. The various specimens sent in competition would be exhibited in some convenient gardens and thus provide a brilliant *fete*. What is mainly wanted to improve public illuminations in London, for example, is combined action under good direction.

PETROLEUM ITEMS.

Another Oil District in Canada.—A recent number of the Toronto *Globe* gives the following account of a new oil district in Canada:

The public are aware that, at the time when the riches of the Enniskillen petroleum wells were first made fully known, it was remarked that about seventeen or eighteen miles south, on the river Thames, petroleum had been known to flow from the clefts of the rocks ever since the discovery and settlement of the country, and that the Indians had been in the habit of resorting to the river to dip their blankets in the stream and collect the oil. A number of Americans and others visited the spot, took up claims, and began the excavation of wells. They found unexpected difficulties in their way. They dug chiefly on the bank of the river, where they were liable to be flooded with water. Some discovered quicksands and boulders, and others suffered from accidents consequent upon carelessness and inexperience. The region being further down the incline than Enniskillen, it was speedily found to be necessary to dig to a much greater depth before reaching the rock in which the oil has always hitherto been found. This was a cause of disappointment to the well owners, and one by one they departed, until Messrs. Duncan & Clark, of this city, and Mr. Lick, who had had some experience of the business in Pennsylvania, were left to labor alone. Mr. Lick dug two wells, one after another, and failed in both, from accidental causes, but the show of surface oil was so good that he was not discouraged. He felt confident that success would yet reward his efforts, and with the aid of the neighboring residents he commenced a third well in the most favorable locality he could select. By the skillful and persevering use of his machinery, he sunk his well in a very short space of time to the depth of 185 feet, where he struck the rock. The show of surface oil was favorable, and continued to improve as he drilled deeper. When he had reached the depth of 30 feet in the hard substance, the flow of oil became more profuse, and he began to prepare tanks, and to provide for the stoppage in case of an overflow. When he reached the depth of 44 feet, he began to pump, and the oil then flowed spontaneously. Last Saturday it flowed for two hours and a half at the rate of 40 barrels per hour, and on Monday it flowed for an hour at the same rate. The flow in large quantities is, as we are informed, intermittent, but at the present rate the well is capable of yielding about 70 barrels per day. Mr. Lick is confident that by drilling deeper, a still larger outpouring without pumping may be obtained. The oil is said to be of very superior quality, having been burned in the lamp without refining. Further experiment and practical operations will be necessary to define its richness, but we see no reason to doubt that another oil region of considerable extent and value has been discovered in the Western peninsula. The new is even more favorably situated than the old for the conveyance of the petroleum to market. The wells have been dug on the banks of the Thames, a stream of considerable size, down which barrels of oil may be floated at almost any season of the year, to Chatham, where large schooners come to load. They are situated also not more than from one to two miles from Bothwell station, on the main line of the Great Western, so that the cost of conveyance, either by land or water, will be much less than from the Enniskillen oil region.

A correspondent of the Canada *Free Press*, writing from Cashmere, March 26th, also refers to the new oil region in the following terms:

I take the liberty to sent you a few lines in reference to the Thames Oil Company, its expenses and prospects. The well is about two miles and a quarter from the Bothwell Station, G. W. R., and within four rods of the County line of Middlesex, on the farm of James Coleville, Esq., township of Zone; it was commenced about the 15th of June, 1862; the amount expended up to the present time (exclusive of the use of engine and tools) is about $1,700; depth of well 224 feet, 180 of which is clay and sand, and 44 feet rock. The oil and gas was found in two or three places while sinking the well, but not in paying quantities until at the depth of 224 feet, at which time the gas forced in the sand and filled up the hole upwards of fifty feet. The sand-pump was put to work, and in a few days the hole was cleared of all obstructions. The oil-pump was put in on Saturday morning, and twenty barrels of the pure oil pumped into the tank; on Monday, twenty barrels more; on Tuesday, about the same quantity, and still it comes. The superintendent, J. S. Lick, is of the opinion, that with a little deeper drilling, a flowing well will be got.

A Petroleum Well in Wales.—Considerable excitement has been caused in Monmouthshire by the discovery of a natural oil spring at Blania. It appears, from what we can learn, that a man employed by Mr. Lewis, a contractor, while pumping water from an ordinary well on the premises belonging to his master, noticed some oil floating on the surface of the water. Upon further examination, it was found that a spontaneous flow of oil and water was taking place, which continued for some considerable time, during which about four gallons of oil, in appearance much resembling crude petroleum, were procured. We expect, in the course of a few days, to be in possession of a sample of the oil, when we shall have a better opportunity of judging of its quality and nature, but from the information we already possess we should suppose that it is equal to the American oil. We may venture to hope that this discovery will lead to proper researches in the neighborhood, as there is no reason to doubt its existence in much larger quantities. The natural indications in the neighborhood are somewhat similar to those in the established oil regions. It has been determined to have the spring fully explored, and the quality of the oil tested by chemical analysis. In its crude state it ignites freely and burns well. The occurrence has created much interest, and large numbers of persons continue to visit the well. We may state that this is not the first occurrence of the kind in our own country, a natural spring of mineral oil having been found by Mr. James Young some years since in Yorkshire, but the quantity obtained from it was small. In various parts of Wales the geological formations have led us to suppose it is not improbable that considerable quantities of oil may be obtained.—*London Grocer.*

The London Petroleum Trading Company.—A late number of the *Oil Trade Review* says:—We find that the Petroleum Trading Company, the prospectus of which appeared in our advertising columns last month, is supported by the subscribed capital of some of the most substantlal men in the trade. It is the intention of the promoters to do business on a most extensive scale, sufficient to meet the increased requirements of the trade. We have been informed that arrangements have been already made to conduct the business of a very extensive firm, and their improved system of transport, both by the assistance of the Pennsylvania railway, already secured, and the new iron tank ships built for the purpose, will enable them to land their oil here at a much lower rate than at present. The list closes positively on Thursday next, the 12th inst., and is pretty nearly full. Yesterday (Friday) the first vessel left Falmouth upon its outward voyage, and there are a great many cargoes afloat and consigned to the company. The tank ships which the company are building are progressing very quickly, and will soon be ready. The business doing by the company is stated to be very large.

The Canada Oil Market.—The oil market is pretty much at a stand-still, where it has been for three months, with very little fluctuation, but as navigation is now resumed, we have reason to look for activity before long. Refined oil will not be long without buyers at fifteen cents per gallon, at which figure we have seen it offered. Twenty cents, however, is the ruling price at this point. Crude remains firm at $1 00 at the wells for immediate delivery, with a demand equal to the supply at present. We hear of some transactions in tar at $1 00 per barrel. Good oak and pine barrels are worth $2 00, with great competition.—*Oil Springs Chronicle.*

Origin of Petroleum.—Prof. Henry D. Rogers, formerly of Pennsylvania, but now Professor of Natural Science in the University of Glasgow, Scotland, attributes the origin of petroleum to the subterranean heat, which, converting the bituminous into anthracite-coal, had the effect of distilling from that coal the rock-oil or petroleum of commerce, which, creeping into the fissures of the strata and impregnating the porous sandstones, remained collected, as it were, in vast underground tanks for the use of the present generation.

Imports of Petroleum into Bremen.—The imports of Petroleum into Bremen, during 1862, amounted to 15,191 barrels, equal to 607,640 gallons.

Dreadful Accident at the Preston, England, Gas-Works.—An English paper gives an account of a dreadful accident which occured Sunday night, January 18th, at the Moor Lane Works of the Preston Gas Company. At one end of the yard is a building called the receiving house, and in which the manufacture of sulphate of ammonia is carried on. The top of the retort is about 7 feet high, and on a level with it, is a small platform, on which are deposited the carboys of oil of vitriol, used in the preparation of sulphate of ammonia. It was the duty of a man named John Willan, the foreman of the fireman, to superintend the manufacture during the night, a duty which he had attended to for many years. Willan went to the works at ten o'clock on Sunday night, being the only person then on duty. About half an hour afterwards, a young woman who was going along Tank street, which runs parallel with the back part of the receiving-house heard moans proceeding from that part of the works. She aroused several of the neighbors, some of whom scaled the wall leading to the receiving-house, while others went for another workman, who unlocked the gates. On entering the receiving-house, the persons who had climed the walls found Willan lying on his back on the floor with a broken carboy of vitriol on his breast. He was uttering low moans, and was quite insensible. He presented a shocking sight; the vitriol, about five gallons, having flowed down his abdomen, legs and thighs, and some of it having spread on his face. His clothes were destroyed, and the acid liquor was consuming the tissues of his abdomen and legs. He was immediately conveyed to a public house adojoining, where two surgeons quickly attended him, but the horrible nature of his injuries precluded all hope of his recovery, and he expired at four o'clock the next morning. How the accident occured can only be conjectured. But it is supposed that the poor fellow had ascended the platform, and was dragging the carboy towards the mouth of the retort, for the purpose of pouring some of the vitriol into the retort, when he slipped backward, and in his fall dragged with him the carboy, which, on touching the floor, broke, and the liquid flowed over his person. The receiving-house was well lighted with gas so that the deceased could well see how to work.

Gas in Italy.—M. L. Badino, the lessee of the gas-works of Verceil, has constructed works to light the small town of Biella. Boghead cannel is the coal used. These works have been in operation since November last. Three benches of fives are used. The gas-holder is of the capacity of 150 cubic metres.

Propylene and Butylene.—Respecting these two ingredients of coal-gas, Dr. Frankland says the first may be obtained by passing the vapor of fusel oil through a red hot tube, and the second by the electric decomposition of valerate of potash. Both these gases are colorless, possess a slight ethereal odor, and burn with a brilliant white flame. Like olefiant gas they are rapidly decomposed at a red heat, depositing much carbon, and being converted into the non-illuminating gases—hydrogen and light carburetted hydrogen. Propylene consists of three volumes of carbon vapor and six volumes of hydrogen condensed to two volumes. It therefore contains in a given volume, one-half more carbon than olefiant gas. It specific gravity is 1.9348.

Mongruel's New Light.—Mr. Mongruel, the "inventor" of the old and exploded air-carburetting process, now admits that it is more economical to napthalize coal-gas, than to naphthalize atmospheric air. This is tantamount to a confession that his "invention" is worthless, or nearly so, as we pronounced it to be when we first heard of it.

The Electric Light.—On the occasion of the recent marriage of the Prince of Wales in London, the electric light was used with great effect in some of the public illuminations. It is stated in the papers that this light was distinctly seen at Windsor, a distance of 25 miles.

PATENTS.

UNITED STATES

38,031.—Mills L. Callender, New York City, for a Hydrocarbon Burner:

I claim, first, The improved lamp deflector, composed of a combination of mica and metal, consisting of a metallic base ring or flange, f, the mica or similar non-conducting cylinder, d, and insulated dome, b, constructed as above set forth.

Second, I claim the use of a mica, glass, or similar non-conducting cylinder when applied to a lamp top for the purposes above specified.

Third, I claim the method of securing the mica to the metal as above specified.

Fourth, I claim constructing the interior adjustable cone, m, of a combination of mica and metal as above set forth.

38,058.—Henry Pease, Brockport, N. Y., for a Rotary Pump:

I claim, first, The sleeve, s, in combination with the piston stem, e, substantially as described, for the purpose set forth.

Second, The adjustable stuffing-box, B, with the perforated waste chamber, n, substantially as and for the purpose set forth.

Third, The combination of the bearing arm, 2, pulley, F, and clutch couplings, 25 and 6, substantially as and for the purpose set forth.

Fourth, The combination of the support, a, water chamber, 17, stuffing nut, b, and waste chamber, n, substantially as and for the purpose set forth.

38,068.—Daniel E. Teal, Norwich, N. Y., for a Water Elevator:

I claim the combination of the ratchet, C, and flange, b, pawl, E', ellipse, F, provided with the projection, c, and attached to the crank, D, the oval, F, encompassing the flanch, b, and all arranged substantially as and for the purpose set forth.

38,069.—J. W. W. Tindall, Liverpool, England, for a process for Deodorizing Petroleum:

I claim the employment of urine in combination with mineral acids as described, for the purpose set forth.

38,070.—Emil Tritten, Philadelphia, Pa., for a Coal-oil Burner:

I claim isolating or partially isolating the screw, E, from the wick tube and from the dome, A, by connecting the said screw to the dome through the medium of arms or projections, e e, the plate, D, attached to the wick tube, and projections, d d, on the said plate, substantially as set forth.

38,071.—M. A. Lebrun Virloy, Paris, France, for Carbonizing Wood:

I claim, first, So constructing and operating a furnace for drying or carbonizing wood, peat and other fuel, as that the said fuel is introduced at one side or end of the furnace, and withdrawn suitably dried or carbonized from the other side, substantially as shown and described.

Second, In combination with a furnace constructed and operated as shown and described, I claim the employment of doors and other openings when so arranged as to allow of their being hermetically closed, during the operation, in the manner and for the purposes set forth.

Third, In furnaces for drying or carbonizing wood, peat or other fuel, constructed and operated as described, I claim the use of taps, valves and registers in the orifices and covers, to increase or diminish according to circumstances, the activity of the fuel and the operation, and for regulating the admission and exit of air, as and other volatile products, substantially as shown and described.

Fourth, The manner, herein described, of collecting and removing from a furnace for carbonizing wood, peat, &c., a portion of the volatile products after the whole or part of their caloric has been utilized, substantially as and for the purposes set forth.

Fifth, The manner, herein described, of utilizing the waste heat, which in the ordinary processes of drying and carbonizing, is carried away by the vapors and gas escaping at a high temperature.

Sixth, The method herein described, of submitting the wood, peat, or other material to be treated, first to a low temperature and gradually increasing it to a high temperature.

38,079.—Hiram W. Hayden (assignor to Holmes, Booth & Hayden), Waterbury, Conn., for a Wick Tube for Lamps:

I claim forming the bearing or support for the shaft of the wick wheels to turn in, by stretching and bending out the metal of the tube between the slots in which the wick wheels work, so as to embrace the shaft between such bent and stretched portion and the outer flat surface of the wick tube outside of the slots, substantially as and for the purpose specified.

38,083.—T. H. Snyder, Camden, N. J., assignor to himself and William Vandyke, Philadelphia, Pa., for Regulating the Flow of Gas to a Soldering Apparatus:

I claim the adjustable notched bolt, M, or its equivalent in combination with the rod, H, its projecting pin, N, and the treddle, I, or its equivalent, the whole being arranged for regulating the flow of gas through the pipe, B, to the burner, substantially as and for the purpose herein set forth.

38,087.—James S. Atterbury and Thomas B. Atterbury, Pittsburgh, Pa., for a Lamp:

We claim, first, As a new article of manufacture, a glass lamp or other article of like material, having a metallic hoop or collar, d, applied thereto, substantially in the manner and for the purpose set forth.

Second, We claim attaching a metal hoop to the collar of a lamp, while the lamp is in the act of being molded or "blown," the lamp, so formed, when withdrawn from the mold, being a complete merchantable commodity in a single piece, substantially as and for the purpose set forth.

Third, We claim making in one piece a glass lamp and collar, substantially as set forth.

38,102.—Willard T. Eddy, West Hoboken, N. J., for a Lamp-heater:

I claim, first, A lamp chimney having two or more openings in its bottom to fit simultaneously to two or more burners, substantially as and for the purpose herein specified.

Second, The arrangement of two or more holes, e e', in the top of the bulb, E, of a lamp chimney, substantially as and for the purpose described.

38,112.—Henry Knight, Brooklyn, N. Y., for Combination Cement and Metallic Pipes:

I claim the application and use of wrought-iron frames or tubes of the form of a truncated cone at one end or along their whole length, to pipes lined or coated with hydraulic-cement mortar, or both lined and coated, for the convenient jointing of the same in their several lengths, and at the same time retaining the cylindrical form and finish.

I also claim the application and use of metallic tapping rings, bosses or thimbles, to pipes of wrought iron, lined or coated with cement mortar, or both lined and coated, substantially in the manner and for the purpose described.

38,117.—J. M. H. P. Metivier, Paris, France, for a Pump:

I claim the employment in pumps of two shafts jointed together, and of inclined pump barrels and pistons, all being fitted and caused to act, substantially as hereinbefore described and illustrated in the accompanying drawings.

38,137.—Levi L. Hill (assignor to Wyman R. Barrett), New York City, for Producing Light and Heat and applying the same:

I claim, first, The combination of the vapors of a hydrocarbon, atmospheric air and steam or the vapor of water, under pressure substantially as described, for producing by ignition an intensely heated jet of flame for generating steam, and for metallurgic and other similar purposes.

Second The use of a platinum cap or chimney constructed and operating as described in combination with a jet of the mixed vapors of a hydrocarbon and air, with or without steam or the vapor of water, for the production of light.

38,138.—Thomas D. Bond, Howard county, Md., for an Apparatus for preventing Obstructions in Water Pipes:

I claim the combination with a water pipe of the trap, E, the strainer, B, the port, A, and the adjustable valves, F and G, or the equivalents thereof substantially as described.

EXTENSION.

H. R. Worthington & Wm. H. Baker (Adelia C. Miller, executress), New York City, for a Method of ensuring the action of the Valves in Direct-action Pumping Engines. Patented April 3, 1849:

We claim, first, The removing or reducing the resistance against the pump piston in direct-action steam pumps at the proper time in the stroke by effecting a connection between the water on both sides of the piston in order to allow either the momentum of the moving parts, on the expansion of the steam already within the cylinder, or both conjoined, to act as explained, to throw the steam valve across the ports with ceriainty, whether at high or low speeds.

Second, We claim the method herein described of effecting the before-mentioned and claimed object, namely, by making two passages into each end of the cylinder, across one of which the piston is forced, opening by this means free communication between the two ends of the cylinder.

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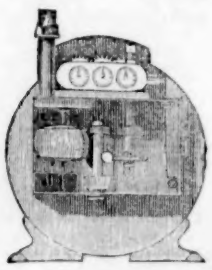

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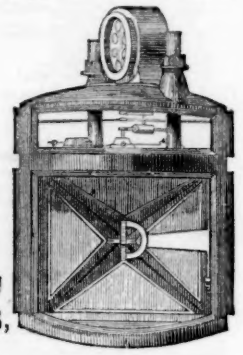

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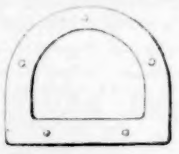

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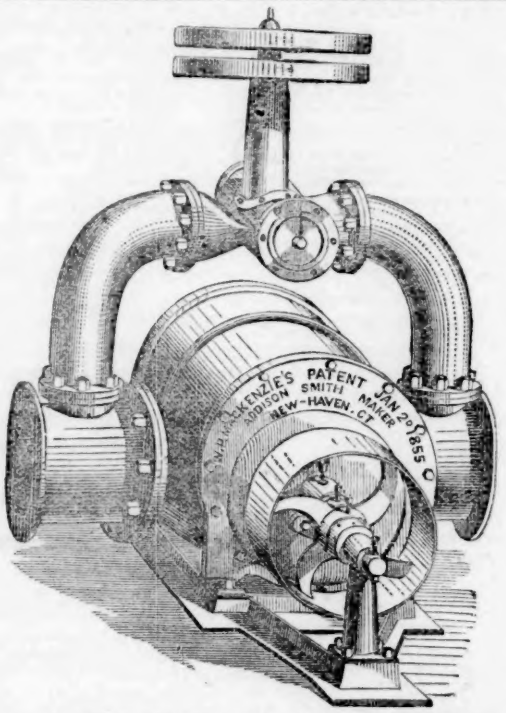

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Iron pipes are at present frequently covered with a coating of bitumen or coal tar before they are laid down; but the adherence of this coating to the metal being very imperfect, on account of vibration and the difference of expansion, this preservation is insufficient, besides being exposed to a number of influences which neutralize its efficacy—galvanic currents materially assist the formation of oxides and deposits, which cause the obstruction and eventually the destruction of metallic pipes.

The Patent Bituminized Pipes are neutral, non-conductors of electricity, and consequently are not exposed to any of the deteriorating influences mentioned above. The process of manufacture of these Pipes consists in causing a roll of paper to pass through a reservoir of melted bitumen, after which it is tightly coiled around a mandril to any required thickness; and thus, when hardened, a tube is formed of perfect texture, great hardness, and enormous strength. These Pipes are proved, by hydraulic pressure, to resist a pressure of 220 lbs. to the square inch, equal to 506 feet head of water, which is more than double the altitude of the highest reservoir. The bituminous composition which unites and covers these Pipes, is so well known as an excellent preservative, that it will be unnecessary to demonstrate that, when laid underground, the durability of the Patent Bituminized Pipes may be considered as unlimited. The Pipes are made in lengths of seven feet, and are connected by socket joints of the same material as the Pipes; or they can be fitted with iron flanged sockets, screwed together in a most simple and inexpensive manner.

For Gas these Pipes are invaluable; the Gas-lining which we insert, effectually resists the action of Gas, and being non-conductors, there can be no dondensation in them, and the joints made with the Patent Cement are so strong as to entirely prevent Leakage.

The cost of laying the Pipe is also small, compared with those of iron, and can be done by mere laborers. The Bituminized Pipes have been in use the last hree years, for the conveyance of gas, and have been ascertained to be as perfect now as when first laid down.

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Pack the pipes level in the ordinary way; slip the collar over one of the pipes; draw the ends close together and warm them by putting a hot iron between them; then press them together so as to make them adhere; take a piece of iron wire netting, about half an inch in the mesh, a little narrower than the length of the collar, and long enough to wrap once round the pipe, spread the collar over it and the joining; close the ends with clay; pour the melted cement into the manhole of the collar, and fill up the interior space; then remove the clay and the joint is finished.

It is necessary to leave a small vent-hole in the clay at each end of the collar to allow the air to escape as the cement is poured in, that there may be no flaws or air-bubles in it when cold. If in cooling the cement settles in the manhole, fill up again.

N. B.—The cement should be broken into small pieces and melted in a pot as you do lead, at a low temperature, until it is dissolved; it must be stirred while melting; then take it off and keep stirring it as it cools until it becomes nearly as liquid as water; then pour quickly.

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These SIGNAL LIGHTS are intended for use on Vessels propelled by Steam, and those exclusively. They specially indicate the presence of a Steamer, and by their use there will be less likelihood of mistakes, and consequent collision, than at present. They are also intended for SIGNALLING AT NIGHT, and can be used for that purpose UNDER ANY CODE of SIGNALS NOW ARRANGED FOR FLAGS.

This Improvement in Lights for Steam Vessels consists in having the Lanterns containing the colored lights connected by means of a series of cogged gearing with some convenient part of the Engine or Machinery, so as to cause them to have a revolving motion around their axis. On side-wheel steamers, the Lanterns should be placed directly over the wheel-houses, and the power, or motion to turn them, may then be very conveniently obtained from the paddle-wheel shaft. On Propellers, the Lanterns should be placed on each side of the Pilot House, or hurricane deck, and the rotary motion derived from any convenient or suitable part of the Engine or Propeller shaft. Each Lantern is supported on the end of movable cranes, so that their relative positions may be changed and properly adjusted to suit the view of observers on either side of the vessel at the time of signalling.

The Lanterns to be used in this improvement may be constructed for Burning Oils, Fluids, Gas, or any of the known modes of illumination, and should be furnished with one or more lenses and reflectors, so as to concentrate the rays of light, and project them over the horizon with the greatest intensity. The lenses for this purpose should be made with colored glass, viz., Red and Green, and the position of the respective Lanterns, according to the color of the lenses therein, must be placed on the sides of the vessel so as to answer to the requirements of Rules and Regulations made and published by the Supervising Inspectors of Steamboats, agreeably to the Act of Congress of the United States in such cases made and provided. That is to say—by said Regulation—the Lantern having the green lenses for producing the Green Colored Light, must be placed on the starboard side of the vessel, and the other Lantern producing the Red Light, to be placed on the port side thereof. In pursuance, also, of the aforesaid Rules and Regulations, there is to be found in board and behind each Lantern, a screen to answer the purposes therein mentioned.

The cogged gearing, by which the Lanterns are connected with the Engine or paddle-wheel shaft, and thereby caused to revolve when the Engine is in motion, is so arranged that the connection may be readily shipped or unshipped, and the Lanterns made stationary or otherwise, at the pleasure of the Pilot, or those whose duty it may be to operate and attend to the same. The cranes on which the Lanterns are placed are also rigged so as to be readily turned horizontally from one position to another, so as to present one or both lights to the view of observers when laying athwart ships at the time of signalling.

On the Use and Application of the Improvement for Night Signals.

When the vessel is under weigh, or going ahead in its course, the Lanterns are to be placed directly athwart ships, so that such colored light therein will then have the position and place prescribed by Rule Seventh of the afore-said Supervising Inspectors of Steam Boats, and with the screens behind them, as above described, will then answer all the intents and purposes for which the colored lights are thus required to be used, as illustrated in the several diagrams published by said Inspectors for the working of a system of Colored Lights. The Lights in this case, according to the color seen by the observer, indicate the course or direction of the vessel whereon they are carried. When the Lanterns with the colored lights therein, are made to revolve around on their axis, as proposed in this improvement, in addition to the signal above, another, and as we believe, very important and useful signal is thus formed, indicating that the vessel, whereon it is carried is a Steamer. In dark foggy nights, it is found by experience, to be somewhat of a difficult task to distinguish sailing vessels from Steamers and Propellers, especially when the latter are rigged, and carry a press of sail. When Steamers meet "head and Head," it is the duty of each to pass to the right, or, on the larboard side of the other. Whereas, when a Steamer meets a sailing vessel, the former must give way and allow the latter to pursue its course. Hence, to carry out the regulations of the said Steamboat Inspectors, and prevent collisions, it is important to have some infallible sign, whereby the character of the vessel may be readily seen and determined. Several very fatal collisions have recently taken place through mistakes of this kind.

On Signals for Speed and Distance.

The gearing of the Lanterns with the paddle wheel or propeller shaft, may be so arranged as to be an index of their speed. A very good proportion, would probably be to make the Laterns turn about one third as fast as said shaft. Hence, when the speed of the vessel is previously known, when making a certain number of revolutions of the paddle or propeller, it becomes an easy task from observing the time with which the Lanterns thereon may be turning to approximate to the speed with which the said vessel is moving at the time of observation. Again, as the arcs described by the rays of light from each lantern, as they revolve around on their axis, is greater in proportion to the distance from said lantern, so will the time in which said rays move over any given space, be less in the same proportion. Hence, when the lights are very remote, or far off, from the observer, the duration of each column or cylinder, of rays from each lense, would pass the eye of the observer, in a short space of time, or with great velocity. Whereas, at a nearer point of observation, the time of its passage would be considerably lengthened, or the motion thereof apparently much slower. From these facts, we believe the improvement is susceptible of indicating, in an approximate manner, the speed and distance of vessels whereon the revolving lights may be used.

On the Application of the Improvement for Marine Telegraphic Purposes.

The Revolving Lights can be readily applied to the general purposes of Marine Signalling at night, as follows: In order to show this application, we have adopted the Numbers as given in Roger's Code of Marine Day Signals, believing that work to be somewhat of a standard in matters of this kind. Instead of the flags used in the above code, for day signals, to indicate the combinations of two or more letters of the Alphabet, which combination is referable to certain numbers indicative of the words or sentences telegraphed, we propose to perform the same operation, at night, by means of the two revolving colored lights, so as to indicate the numbers directly to which the intended words or sentences to be telegraphed are referable. Thus, whether the vessel to be signalled is ahead, astern, or abaft the beam, the position of the two colored lights must be so adjusted, by means of the moveable cranes, whereon said lanterns or lights are fixed, that the two lights may be fully made visible to the observer. When both lights are thrown into this position, stopping the motion of the lanterns may be the signal for calling attention, or a rocket fired off, or the steam whistle blown, would answer the same purpose. Now, in order to represent the ten numerals, we propose to indicate them by the respective motions of the two colored lights, as follows:

RED LIGHT.				GREEN LIGHT.			
One Red, Represents Number			1.	Two Green, Represents Number			2.
Three	do.	do.	3.	Four	do.	do.	4.
Five	do.	do.	5.	Six	do.	do.	6.
Seven	do.	do.	7.	Eight	do.	do.	8.
Nine	do.	do.	9.	One	do.	do.	0.

In the above arrangement, it will be seen that all the odd numbers are made by the Red Light, and the even numbers by the Green Light. In order to indicate the repeat of the last number, once or more times, or for other special purposes, which may hereafter be found useful and necessary, an even number of lights may be shown by the Red, and an odd number by the Green. It will be understood that when the Lanterns are made with three lenses in them, the numerals as above arranged are formed by the number of times a new light or lense is presented to the observer. Thus to indicate the number 3, the Red Light or Lantern would make one entire revolution; and to make the number 6, the Lantern carrying the Green Light would make two revolutions, and so on with the other numbers. When a symbol is made, the motion of the Lantern is to be suspended for a short time, and when a number expressing a sentence is formed, the lantern may be stopped for a longer period, or some one of the special signals above referred to, may be used for this purpose.

To show the application of this improvement as above mentioned, whereby these Lights can be used as readily for Night Signals, as Flags are used for Day Signals by the author of Roger's Code, we shall use the sign ○ colored red or green, according to the light used, to show the number of movements performed by the respective lights in order to represent any desired number of said code, suitable for the required purpose.

RED LIGHT.	GREEN LIGHT.
○, ○, ○, ○, ○,	
○, ○, ○, ○, ○, ○, ○.	
	○, ○.
	○, ○.

The above would represent the number 5722, and by reference to said Roger's Code, would be found to stand before the sentence:

"WILL YOU SHOW THE NUMBER THAT REPRESENTS YOUR NAME?"

RED LIGHT.	GREEN LIGHT.
○.	
○, ○, ○, ○, ○.	
○, ○, ○, ○, ○, ○, ○.	
	○, ○.

Here the number expressed is 1572, and per the same Code, stands for

"WHERE ARE YOU BOUND?"

RED LIGHT.	GREEN LIGHT.
○.	
○, ○, ○, ○, ○, ○, ○, ○, ○.	
	○, ○.
	○, ○, ○, ○, ○, ○, ○, ○.

The number thus expressed is 1928, and per said Code is

"WHAT IS YOUR CARGO?"

RED LIGHT.	GREEN LIGHT.
○, ○, ○, ○, ○.	
	○, ○, ○, ○, ○, ○.
	○.
○, ○, ○.	

Here the number expressed is 5603, and stands for

"HAVE YOU ANY NEWS?"

(RED LIGHT.)

Fig. 2

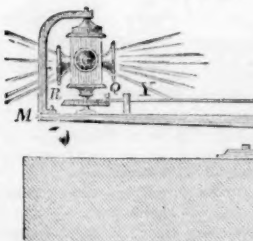


Fig. 3

(GREEN LIGHT)

Fig. 1

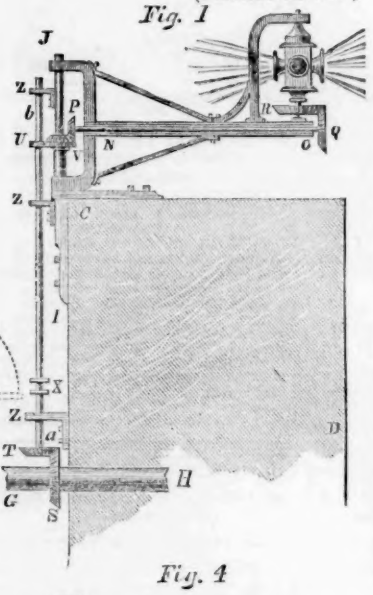
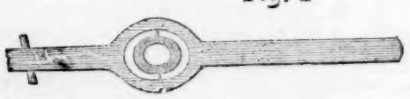


Fig. 4



MECHANICAL CONSTRUCTION.

In our engravings, Figs. 1 and 2, represent Vertical Sections through the wheel-house. In them E F and G H represent portions of the main Shaft. In Fig. 1, I J is a stout Iron or Wooden post, fastened against the side of the wheel-house, directly over the main shaft On the upper part of this post, is fitted the moveable arm or crane N O. to the main shaft is fitted the bevel wheel S, and to the lower end of the rod a b, is fitted a corresponding wheel T. U is a small pinion on a b, which gears with the spur wheel, V, which in turns gives motion to the wheels, P and Q, and so revolves the lamp R. It will be seen that a Rotary motion is given to the lamp, when the main shaft is in motion and a b connected.

It can be disconnected by a lever, acting between the bosses X, which will elevate the rod in the guides Z Z Z.

Fig. 2 is another arrangement, for the same purpose. In this, K L represent a hollow Shaft, on which is firmly fastened, the arm L M, on which is the lantern. The hollow post is secured to the wheel-house by the straps K and B, and it can turn freely in them, the other part being the same in them as in fig. 1

The lever K W, when drawn down, will turn the frame in any required position around the Shaft c U. In fig. 1, the arm or crane N O. may be operated by cords from the wheel house, but in this device, the rod c U. does not lift up as in fig. 1, but in its place, the lower end is made square, and on it slides the short tube, d E, shown in fig. 3. The lower end of the rod turns on a bridge, f g, spanning the main shaft. On the upper end of the tube, d e, a lever is attached by means of boxes and collars as shown in fig. 4. This lever when raised carries with it the beveled wheel T, thus disconnecting the gearing apparatus.

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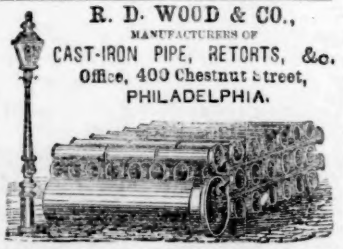

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